SEPTEMBER 1958

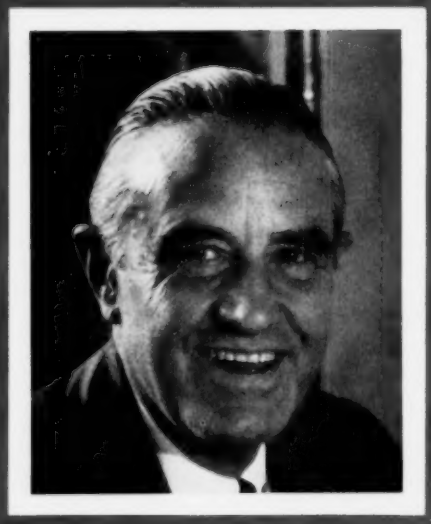
Traffic Safety

QUARTERLY RESEARCH REVIEW

Technical Section

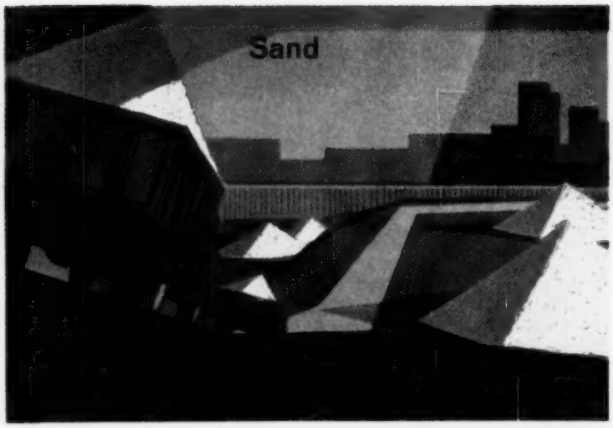
A NATIONAL SAFETY COUNCIL PUBLICATION

A Revealing Interview With Governor Harriman



Scooter Schools Tackle Trouble

Fleet Accidents That Didn't Happen



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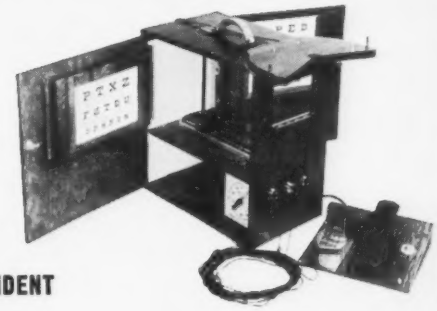

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5. Night Vision
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7. Reaction Time

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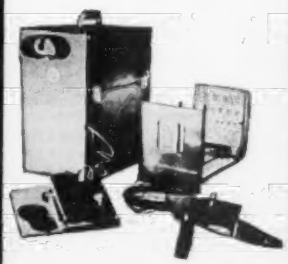

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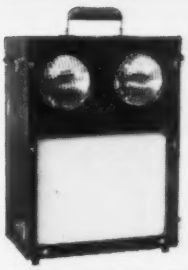

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- Contains 180 questions and answers based on the Universal Motor Vehicle Code.
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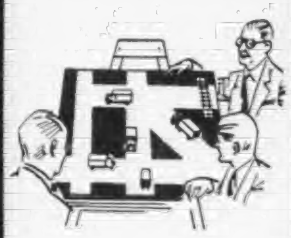

SEEING IS BELIEVING! MAGNO SAF-T BOARD

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- Uses actual scale models of cars, trucks, signs, stanchions, etc.
- Proven, quick, practical way to teach drivers the PRINCIPLES of SAFETY.
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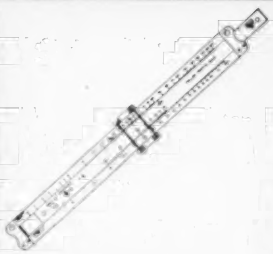

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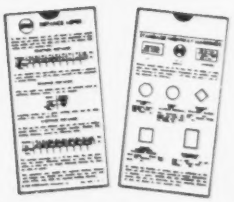
Plus Standard Highway Markings Chart

Handy, pocket sized — contains:

- Reaction, Braking and Total Stopping Distances in feet for individual scoring.
- Standard Highway Markings, location and meanings.
- A Simple, Effective Safety Device for Everyone who drives.



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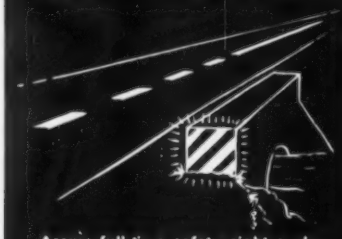

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MAIL BAG

Dear Editor:

The two articles on safety belts in the June issue were very interesting and I am sure the acceptance and use of automobile seat belts will increase if your organization continues to endorse them with articles like these and like the one which was published about a year ago entitled "Are Seat Belts Good or Bad."

You might be interested to know that last winter we discovered that the use of seat belts was not being taught in the high school driver education course that is taught in most of the high schools in the state of Michigan. We took this up with the Michigan State Department of Education and in view of the unqualified endorsement of seat belts by the Roberts Sub-Committee on Traffic Safety, the Department of Education agreed that the use of seat belts should be taught in the driver education course. However, they had no text for this subject and thought it would take at least a year before a text could be made available.

I showed them the article in *Traffic Safety* "Are Seat Belts Good or Bad," and expressed the opinion that this article was actually the equivalent of a text book on the subject as it answered about every intelligent question that could be asked about seat belts. They agreed that the article could pinch hit as a text and so we furnished them with 1,200 reprints which they sent out to all the high school instructors with their recommendation that it be used as a temporary text so that the use of seat belts could be taught to all the student drivers.

Bob Wait
Vice President
Hastings Manufacturing Co.

Dear Editor:

If you have ever been in a position where you could observe a railroad train approaching from a distance, you may have noticed that its headlight was turned on. And it is now standard practice on all

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Made of 100% Blue Wool Gabardine . . . long life cravenetted . . . lining of 100% wool . . . inside wristlets for added protection. With Timton collar and lapels.

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Traffic Safety

Volume 53 Number 3 SEPTEMBER 1958

A NATIONAL SAFETY COUNCIL PUBLICATION

TRAFFIC SAFETY is dedicated to the prevention of traffic accidents through the presentation of objective information and responsible opinion to official agencies, public support groups and the motor transportation industry. The views expressed do not necessarily reflect the beliefs or policies of the National Safety Council, but they are presented in the conviction that the pressing social problem of traffic accidents can best be resolved through freedom of expression and open debate.

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BETWEEN STOPS

IT'S CHRISTMAS in September in the public support section of this issue. The reason? To give traffic safety campaigners the facts on holiday accidents—plenty of facts in plenty of time for December programming.

"Holiday Horror" on page 22 gives how-to-do-it information. "Holiday Hazards" on page 24 is a fact sheet giving statistical data on holiday-type accidents.

Speaking of fact sheets, there's another one in this issue. It's about turn signals, and it appears on page 17.

You've probably noticed a rash of fact sheets in TRAFFIC SAFETY lately. And there'll be more in coming months. The idea behind this "fact-sheet-itis" is to provide a fund of information which may be used in preparing talks, literature or other promotional material. The fact sheets may also be distributed to the public as is.

For the latter purpose, you may planograph them locally or purchase reprints from NSC.

TRAFFIC DEATHS DOWN FIRST SIX MONTHS OF 1958

Toll running 7 per cent under same period last year

AT THE halfway point in 1958, traffic accidents had cost the lives of 16,240 persons in the United States.

Grim as that statistic is, the situation on the highway has improved so much this year that, if the favorable trend continues through the final six months, a saving of 1,500 lives from last year's 38,500 toll can be expected.

The six-month death total of 16,240 was 7 per cent under the 17,510 figure for the same period last year. It was the lowest six-month toll since 1954, when 16,005 persons were killed.

June alone brought a saving of 300 lives, with a hefty 9 per cent drop from 3,310 last year to 3,010 this year. June was the 18th out of the last 19 months to show a decrease.

On the basis of incomplete reports, disabling traffic injuries for the six-month period were estimated at 550,000.

Mileage figures are available for only four months, with travel up 2 per cent for that period. For the same months, deaths were down 8 per cent, resulting in a mileage death rate (deaths per 100 million miles) of 5.1 —lowest on record for the comparable period. The April mileage death rate of 4.9 also set a new record—the lowest ever achieved for a single month.

Twenty-five of the 48 states had fewer deaths in June than in the same month last year. Three had no change and 20 had more deaths.

For six months, 31 states showed decreases, 16 had increases, and one reported no change.

Cities led the way in June, according to reports from 660 cities over 10,000 population, showing a 15 per cent decrease from June of last year. For six months, these cities showed a 5 per cent decrease from last year. Cities with fewer deaths in June totalled 132, compared with 90 having more deaths; 438 showed no change (mostly perfect records).

For six months, 246 had decreases while only 208 had increases, with 206 showing no change.

In June, 511 of the 660 cities had perfect records. Of these, the three largest were: Kansas City, Mo., (457,600), Omaha, Neb., (278,200) and Tampa, Fla., (269,900).

At the end of six months, 239 of the 660 cities still had perfect records, and of these the three largest were: Orlando, Fla. (89,300), Racine, Wis. (81,700) and Portland, Me. (80,500).

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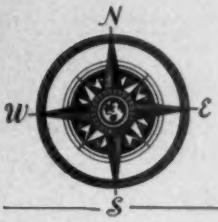
Leading at the End of June

States

Vermont	—39%	Pennsylvania	—11%		
Connecticut	—35%	New Jersey	—11%		
West Virginia	—32%	Oregon	—11%		
South Carolina	—26%	New Mexico	—11%		
Arkansas	—23%	Kansas	—10%		
Illinois	—22%	Rhode Is'and	—10%		
Michigan	—19%	Georgia	— 9%		
Iowa	—19%	Wisconsin	— 6%		
Indiana	—17%	Kentucky	— 6%		
Missouri	—16%	Montana	— 6%		
Delaware	—14%	New Hampshire	— 6%		
Texas	—13%	California	— 5%		
Ohio	—13%	Virginia	— 5%		
North Carolina	—12%	Utah	— 5%		
Alabama	—12%	Maryland	— 3%		
		Maine	— 2%		

Cities

Long Beach, Calif.	—57%	Kansas City, Mo.	—16%
Toledo, Ohio	—44%	Chicago, Ill.	—13%
Wichita, Kan.	—44%	Dallas, Tex.	—12%
Dayton, Ohio	—33%	Detroit, Mich.	—11%
Oakland, Calif.	—31%	Providence, R. I.	—11%
Memphis, Tenn.	—29%	Los Angeles, Calif.	— 8%
Worcester, Mass.	—29%	Boston, Mass.	— 8%
San Francisco, Calif.	—28%	Akron, Ohio	— 7%
San Antonio, Tex.	—27%	Houston, Tex.	— 6%
Cleveland, Ohio	—25%	Fort Worth, Tex.	— 6%
New Orleans, La.	—23%	Philadelphia, Pa.	— 5%
St Louis, Mo.	—21%	Minneapolis, Minn.	— 5%
Washington, D. C.	—16%	Portland, Ore.	— 5%
Indianapolis, Ind.	—16%		



Today's Traffic

LOOKING AHEAD

Clear truck windshields

Hoosier truck drivers now carry their permit stickers on the door instead of the windshield. In July an outside door decal (driver's side) replaced the old PSC windshield sticker in Indiana. Decal is issued by the Indiana Public Service Commission.

Legal protection for doctors

In New York, physicians who extract blood from drivers for chemical intoxication tests are now protected by law from liability or legal action by the driver. Any such suit can be brought only against the state or appropriate political subdivision. In cases of gross negligence or bad faith by the physician, the state or political subdivision can bring suit against him.

Hard hats on highway

Safety helmets are now being worn for off-the-job as well as on-the-job safety by employees of the American Cyanamid Corp., of Pensacola, Fla. Reason? J. P. Robertson, an employee of the Cyanamid plant, recently cheated death in a serious automobile accident because he happened to be wearing his helmet as he rode home from work. Robertson's doctor said that the helmet prevented a fatal injury, or at least a much more critical injury than the slight fracture of the neck he received.

Whole company for safety

At the Boeing Airplane Co. in Seattle, community safety is a major concern of both employees and management. The employees' Good Neighbor Fund recently donated $5,000 to the Seattle-King County Safety Council. The council also received a contribution from the company.

General Tire safety contest

The General Tire & Rubber Co. is offering 20 college scholarships for the best answers to the question, "What can be done to assure greater highway safety?" Scholarships range from $1,000 to $200. The contest, which is being conducted through the company's dealers, closes December 15.

Optimists want driver education

Delegates to the fortieth annual convention of Optimist International adopted a resolution encouraging all states and provinces to institute legislation requiring all persons under the age of 18 to complete a course in driver education before obtaining a driver license. The resolution also urged every Optimist club to join with police, civic and fraternal organizations in an effort to promote traffic safety.

Blind man at wheel

In Green Bay, Wis., a man was arrested for letting a totally blind man drive his car. How did the blind man manage? The car owner sat beside him and gave directions. Explained the owner, "He had never driven, and I wanted to give him the feel of the wheel."

Tough choice

And the Florida Highway Patrol reports that a man turned in his driver license with the comment that he was forced to do so by the welfare commission under penalty of losing his pension for the blind.

Would raise license age

Washington State's Attorney General John J. O'Connell has proposed that the state's minimum age for obtaining a driver license be increased from 16 to 18. The recommendation is a part of a program being developed for submission to the 1959 legislature as a means of combatting juvenile delinquency.

Iowa accentuates the positive

Iowa's new driver license test will get drivers-to-be thinking positively about driving safety. The exam has a set of 20 multiple choice questions. For each question, there are *three* correct answers and only *one* incorrect one. The idea is to have each applicant looking at 60 right answers and only 20 wrong ones.

Good neighbors

A comprehensive motor carrier license reciprocity procedure has been submitted by the Pan American Highway Congresses to the council of the Organization of American States. Upon approval by the organization, the recommendation will be submitted to the individual countries for ratification.

High cost of accidents

Rear Admiral J. C. Daniel, USN, Commandant, Sixth Naval District, stated in a recent letter to the governors of the seven states which compose the sixth district that each accident in which a serviceman is injured or killed costs the taxpayers approximately $30,000.

Family Days in Bay area

The San Francisco chapter of the National Safety Council again sponsored "Family Days" over the Fourth of July weekend to guide people into safe pursuits. The series of events included guided tours, midget auto races for 4- to 12-year-olds, open house on vessels, fireworks, a horse show, a polo game, trout fishing and a swimming meet.

Bicycle safety bandwagon rolls

As Johnson & Johnson's bicycle program rounded out its second year, the company announced that more than 3,850 communities and thousands of civic leaders are participating in the program. The bicycle safety program was developed by Johnson & Johnson, manufacturer of surgical dressings and baby products, in cooperation with the National Safety Council and the Bicycle Institute of America.

BILL WOULD CHANNEL $28 MILLION ANNUALLY TO DRIVER EDUCATION

Federal aid for driver training program development in states has been proposed in Congress. The proposal was contained in a bill (H. R. 12804) known as the "Driver Training Research and Facilities Act of 1958."

If passed and signed by President Eisenhower the bill would channel $28 million annually to participating states for use in conducting research, providing facilities and developing improved methods for driver training.

The bill declares it to be a policy of Congress to promote safety in motor vehicle transportation in interstate commerce by assisting states in driver training programs. It specifies that such assistance contributes to the development and preservation of a national highway transportation system adequate to meet the needs of commerce and national defense and to provide for the greatest safety in use of highways.

Rep. Kenneth A. Roberts of Alabama, Chairman of the Special Subcommittee on Highway Safety of the House Interstate and Foreign Commerce Committee, introduced the bill June 4. It was referred to the committee and hearings were held June 17.

Here are the major provisions of the bill:

Eligibility: The states, territory of Hawaii, Commonwealth of Puerto Rico and District of Columbia would have right to participate.

Administration: The program would be handled by the Secretary of Health, Education and Welfare.

Appropriation: Annual appropriation for the program would be $28 million starting with the fiscal year beginning July 1, 1958; the funds would be apportioned among participating states in proportion to their population compared to total population of all participating states.

Uses: Funds could be used only for:

1. Research for securing necessary educational information and data as the basis for the improvement and development of driver trainer programs.

2. Purchase or rent of facilities, equipment, training aids, and other necessary supplies, including, but not limited to, driver training programs.

3. Assistance in the promotion of training methods and in the establishing of proper curriculums through workshops, conferences, short courses and related methods.

Qualifications: In order to qualify for aid a state would be required to:

1. Match 100 per cent, with state or local funds, or both, the appropriation available to it under the Act.

2. Accept provisions of Act through its legislative authority and designate or create a state board, of not less than three members, with power to cooperate with the Secretary of Health, Education and Welfare.

3. Submit plans on proposed use of appropriation and show that funds will be used only in connection with driver education given in schools or classes under public supervision or control.

COMING EVENTS

Sept. 8-12, Charlottesville, Va.

First International Skid Prevention Conference (University of Virginia). Contact John B. Kinker, University of Virginia, Charlottesville, Va.

Sept. 12-14, Glenwood Springs, Colo.

Governor's 1958 Teen-Age Traffic Safety Conference. Contact H. A. Storey, Colorado Highway Safety Council, Room 14, State Museum Bldg., Denver 2, Colo.

Sept. 14-19, San Francisco, Calif.

Annual meeting of the American Association of Motor Vehicle Administrators (Fairmont Hotel). Contact AAMVA, 912 Barr Bldg., Washington 6, D. C.

Sept. 16-18, Cleveland, Ohio

Twentieth Annual Ohio State Safety Conference (Hotel Pick-Carter). Contact H. G. J. Hays, secretary-treasurer, 8 East Chestnut St., Columbus 15, Ohio.

Sept. 16-20, Copenhagen, Denmark

Fourth International Study Week in Traffic Engineering sponsored by World Touring and Automobile Organization, 12 Chesham Pl., London, SWI, England.

Sept. 18-19, Rockland, Me.

Thirty-first Annual Maine State Safety Conference (Samoset Hotel). Arthur F. Minchin, secretary, Department of Labor and Industry, State House, Augusta, Me.

Sept. 21-22, Lafayette, Ind.

Third National Conference on Driver Education. (Purdue University)

Sept. 21-23, Copenhagen, Denmark

1958 International Road Safety Congress sponsored by World Touring and Automobile Organization, 12 Chesham Pl., London, SWI, England.

Sept. 24-26 Northampton, Mass.

A freeway operations seminar sponsored by the Institute of Traffic Engineers. Contact Roger T. Chandler, city traffic engineer, Providence, R. I. or Institute of Traffic Engineers, 2029 K St., N. W., Washington, D. C.

Oct. 1, Washington, D. C.

Seventh Annual Commissioners and Governors Conference on Metropolitan Washington Traffic Problems (Sheraton-Park Hotel). Contact Anthony L. Ellison, executive director, Room 1020, Municipal Center, Washington 1, D. C.

Oct. 12-17, New Orleans, La.

American Transit Association (Roosevelt Hotel). Contact ATA, 292 Madison Ave., New York, N. Y.

Oct. 20-23, Philadelphia

International Municipal Signal Association (Sheraton Hotel). Contact IMSA, 130 W. 42nd St., New York, N. Y.

Oct. 20-24, Chicago

Forty-sixth National Safety Congress and Exposition (Conrad Hilton Hotel). R. L. Forney, secretary, National Safety Council, 425 N. Michigan Ave., Chicago 11.

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our most populous state, long a pace-setter in many facets of American life, has not been a leader in traffic safety. But all this is changing, as Traffic Safety found in this . . .

INTERVIEW WITH GOVERNOR HARRIMAN

Q New York has greatly stepped up its attack on traffic accidents. Have you any results to show for it?

A Absolutely. Last year the number of traffic deaths declined. The death rate per 100 million miles has declined for three years. In 1955 it was 5.3. By last year it had dropped to 4.9, the lowest in our history. We are now a full point below the national average of 5.9. We are fourth in the nation in terms of traffic deaths per 100,000 population. However, I must emphasize that these statistics are rather like paper profits in the stock market. I will not consider we have made any real advance until the actual number of traffic deaths has sharply declined.

Q With more cars and more travel, do you think the number of traffic deaths can ever be significantly reduced?

A I know it can. Let me give you a concrete example. Last year we cut traffic fatalities from 10 to one on the Taconic State Parkway—one of our great four-lane highways which runs north and south through the Hudson Valley. Personal injury accidents were reduced 17 per cent, property damage accidents 27 per cent. We did it simply by stepping up the enforcement activities of the state police. They increased the number of arrests by 52 per cent and reduced the number of accidents by 27 per cent.

Q Then do you think stricter enforcement is the key to reducing accidents?

A Obviously enforcement can produce the quickest, most dramatic results. However, unless we want to put half the population in uniform, to keep an eye on the other half, the big drop won't come until the great majority of drivers obey the law because they want to, not just because they have to. I consider safety education, in its broadest sense, the most important element.

Q Do you think the public will respond to education?

A I have no doubt about it. Look at the field of medicine. In 50 years the nation has changed from indifference or actual opposition to measures such as inoculation against smallpox, to acceptance, and finally to insistence on them. I think today it is possible to get the same change in the public attitude towards traffic accidents.

Q What makes you think the public attitude towards traffic safety is changing?

A Primarily the heartening reaction to our traffic safety program in New York. The mail has been uniformly favorable. In traveling about the state hundreds of citizens have volunteered comments to me about our efforts. The press has supported us right down the line. Another highly significant indicator is the apparently changing public attitude toward automobiles. Small cars with small horsepower are becoming increasingly popular. My wife drives a small American-made car. I think the driving public is acquiring a much more sensible attitude toward automobiles.

Q You compared the problem of traffic accidents to a public health problem. Do you feel we really know enough to solve this problem as we have public health problems?

A Unfortunately, no. Not yet. Our most pressing need is to learn more about the causes of accidents. Each day at nine o'clock a state police report on fatal accidents of the preceding day is placed on my desk. I find it absorbing but sometimes exasperating reading. Day after day I am told that fatal accidents were caused by "speed" or "driver error." It's like a coronor reporting that a person died of lack of breath. The questions we must ask are "Why was the driver speeding?" "Why did he make a mistake?" That's the guts of the problem.

Q What do we need to know that we don't know now?

A Two things, mainly. We need to know more about the personal factors that lead to accidents, and we need to know more about accident free driving—so we have a standard norm with which to compare the abnormal. It has been said that man's progress is directly related to his ability to build measuring devices. This is especially true in traffic safety. We are continually hearing statements such as the one about the most dangerous time to drive is between 5 p.m. and 7 p.m. because those hours have the highest percentage of accidents. This is absolutely meaningless unless we know how high a percentage of all driving is done during those hours.

Q What do you mean by the personal factors that lead to traffic accidents?

A I mean physical factors such as eyesight and reaction times, and mental factors such as aggressiveness, which some people apparently express by driving at high speeds and defying traffic regulations. It seems to me we have to find out more about the nature of these appeals and learn to channel them towards safety rather than away from it.

Q Would additional knowledge about accidents change the pattern of traffic safety activities?

A I'm sure it would shift some of the emphasis. Speeding, for instance—perhaps it gets too much of our attention to the neglect of other equally important factors. Analysis shows in New York State last year the overwhelming majority of injuries occurred at speeds below the legal limit. Simply to crack down on speeding will not eliminate the overwhelming number of accidents. As a matter of fact, I have urged that some of the unreasonably low speed limits within our state be raised. To keep them where they are now simply breeds disrespect for traffic regulations in general.

Q What is New York doing to learn more about the causes of traffic accidents?

A Two years ago we established the Driver Research and Testing Center, which acts as a medical consultant to the Bureau of Motor Vehicles on licensing problems, plans basic research to determine and quantitate the human factors which contribute to motor vehicle accidents, and coordinates the crash injury studies which have been under way during the past 10 months on the New York Thruway. The Center is especially concerned with how accidents might be prevented through the selective use of tighter licensing standards.

Q What other steps have you taken recently to improve New York's traffic safety program?

A Shortly after I took office in 1955, we hired an outside consultant to make a survey of our traffic safety program. The findings came as rather a shock. We found we had fallen seriously behind National Safety Council standards in many areas. Since then we have been working to bring ourselves up to the standard. We have begun an automobile inspection program, instituted compulsory liability insurance, increased the number of state troopers, established special licenses for truck drivers, revised our point system to increase penalties for safety violations, adopted the uniform rules of the road, set up a Citizens Council on Traffic Safety, taken steps toward establishing an independent Bureau of Motor Vehicles and in general overhauled our entire program.

Q How does New York measure up to the 27 recommendations of the 1956 Governors' Conference?

A We have fulfilled 12 of the 18 immediate objectives and are actively working on the remaining ones.

Q What about the long-range objectives?

A We are determined to meet every one of them and have already met seven of the nine and have begun to move on the others.

Turn Page

"The mail has been uniformly favorable. The press has supported us right down the line."

"I think today we are on the verge of a change in the public attitude toward traffic accidents."

"The driving public is acquiring a much more sensible attitude toward automobiles."

Q How has the motor vehicle inspection program been working?

A Our program began in February, 1957, and has been most successful. We now have over 8,000 public inspection stations throughout the state giving annual checkups to all cars over four years old. Because of the cost we have decided not to extend inspections to newer cars as we find very few of them have accidents attributable to mechanical failure.

Q What are the special truck drivers licenses you mentioned?

A I believe we are the first state in the nation to adopt special licenses. One terrible day in the summer of 1956, 11 persons were killed in four separate tractor-trailer accidents in New York, all of which were caused by the truck or the truck driver. I called for an immediate investigation which led to a statewide conference. Until then anyone with a regular operator's license could obtain a chauffeur's license simply by applying. The conference agreed that to enable anybody who could drive a passenger car to get behind the wheel of a 60-ton tractor-trailer was madness. A committee, including representatives of the truck owners and drivers, drew up recommendations for establishing four special classes of chauffeur's licenses requiring special tests on the respective type of vehicle. They became law this year. We also tightened up standards for brake mechanisms and increased the number of special speed and "low gear" signs for tractor-trailers. We hope more states will adopt similar measures as this is very much an interstate problem.

Q What's this about you wanting New York to be the first state to make it illegal to fall asleep at the wheel?

A That's right. In the state police reports, I kept encountering fatal accidents involving a driver going to sleep. We looked into the matter and found that many of them had in fact been drinking. By claiming to have fallen asleep they were getting away without punishment. As a young man, my first job was in safety on the Union Pacific railroad. I was taught there is no such thing as an accident—somebody is always to blame and should be made to realize it. We are simply extending that principle to drowsy drivers.

Q What do you regard as the most important forward step you have taken in the traffic safety field?

A In terms of long-range effect, the establishment of the Traffic Safety Policy Coordination Committee within the state government is probably the most important thing we have done. Until it got started, safety responsibility was divided among a half dozen departments. They worked together, yes, but they never *planned* together. Now the commissioners of Taxation and Finance, Motor Vehicles, Public Works, Education, and Safety and the superintendent of state police sit down together at least once a month with my secretary and work through a stiff agenda.

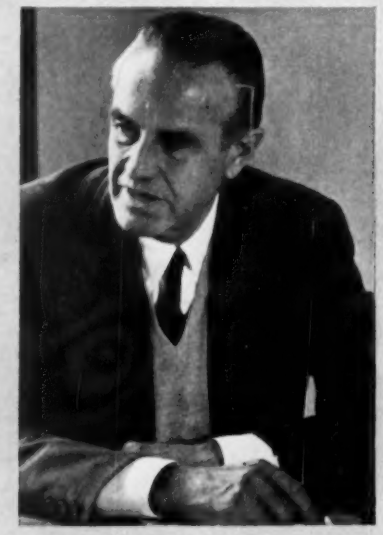
Q Has the committee done anything specific?

A Quite definitely. It has, for instance, just completed a major revision of the point system. We now assign more points for serious violations and fewer for violations that do not concern safety.

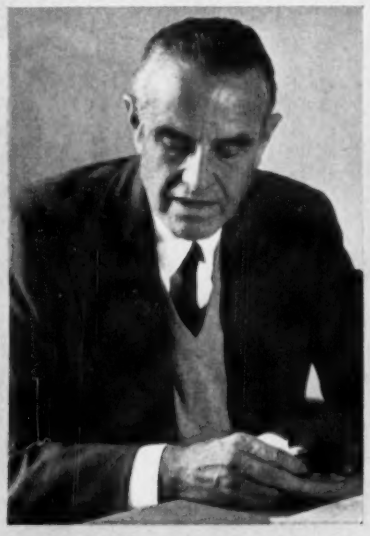
Q Anything else?

A A good example is the problem of drunken drivers. Under our law the penalty for a drunken driving conviction is mandatory—loss of license. The trouble is many persons depend on driving for a living, and judges and juries just won't take their means of a livelihood away

"The big drop won't come until the great majority of drivers obey the law because they want to."



"I consider safety education, in its broadest sense, the most important element."



"The one thing that can make legislators demand action is the fear of losing votes.'

by finding them guilty. The committee is considering ways in which the mandatory revocation law might be revised to obtain more convictions. One suggestion is that drunken drivers be given the alternative of losing their licenses or using special "drunk" plates on their cars for a specified period.

Q What would you say are New York's most outstanding needs in traffic safety?

A Our Traffic Safety Policy Coordination Committee has just completed a study of that subject. There are six main points:

(1) To develop greater safety consciousness among drivers and pedestrians. This is being led by the New York State Citizens Council, a group of about 100 persons prominently identified with safety which I appointed last December.

(2) To maintain the pace of our highway construction program.

(3) To improve methods of enforcement.

(4) To improve methods of driver testing and driver improvement.

(5) To extend driver training to all eligible high school students and as many adults as possible.

(6) To give the Motor Vehicle Bureau full departmental status to modernize and streamline licensing, registration, and accident record keeping.

Q More than half of the safety program you submitted to the legislature concerned enforcement. Almost all of it failed to pass, didn't it?

A Yes, most of it was turned down. Here are the main points we asked for: (1) automatic suspension of drivers' licenses for 60 days upon two convictions for reckless driving or speeding within 12 months; (2) a

Edwin S. Smith of NSC presents governor with Certificate of Achievement for New York's 1957 traffic death record and traffic activities performance.

Governor addresses joint session of legislature. A "people's lobby" for traffic safety is now shaping up to get needed legislation passed.

Corp. Joseph L. Cross demonstrates safety belt to governor and Supt. Francis S. McGarvey. Belts are now required on all new official state cars.

This year New York passed legislation establishing four special classes of chauffeur's licenses requiring special tests. Here governor signs bill.

presumption that the registered owner was driving a vehicle observed in a moving violation; (3) repeal of an out-dated law preventing the use of stationary speed measuring devices on most state highways; (4) an increase in the number of state troopers available for highway patrol duty; (5) treat bail-jumping the same as conviction for purposes of license revocation and suspension; (6) authorize the suspension of licenses of drivers who repeatedly fail to appear in court in response to summonses for moving violations; (7) give to the motor vehicles commissioner the authority, in accordance with the provisions of the Uniform Vehicle Code, to suspend licenses of drivers who become involved in accidents; (8) treat out-of-state convictions the same as convictions in New York State for purposes of license suspension or revocation; (9) tighten rules for license suspension and revocation for drivers under 18; (10) afford protection for doctors administering blood tests to drivers believed to be intoxicated; (11) make falling asleep at the wheel of a moving vehicle an offense and authorize the commissioner of motor vehicles to suspend or revoke the license of a driver who has become involved in an accident because of falling asleep; (12) make driving under the influence of narcotics to an extent sufficient to impair driving an offense equivalent to driving while intoxicated.

Q If, as you say, the public is ready to support necessary traffic safety measures, why did the legislature fail to pass 14 of the 16 new enforcement measures you proposed?

A I frankly just don't know. The legislative record, if I may quote one of our most prominent newspapers, was "deplorable." Ignorance cannot be the complete reason, as some of these measures were originally introduced a year ago and were familiar to everyone. Others were substantially equivalent to measures introduced by a legislative committee studying this subject. The only explanation I can think of is indifference combined with election-year jitters about alienating any voters by tougher laws. All I can say is that I think the legislature is wrong and the Citizens Council is right. Perhaps in fairness I should say that the *legislative leaders* are wrong, because no vote was ever taken on any of the 14 measures that failed to pass. They were all killed in committee by the legislative leaders. If they had been reported out and voted upon freely by the legislature as a whole, the result might have been very different.

Q Can anything be done about legislative inaction?

A There can, and we are going to do it. The one big obvious lack at this last session of the legislature was public support for traffic safety legislation at the grass roots. The plain fact is that the one thing that can make legislators demand action on traffic safety legislation is the fear of losing votes in their constituencies. Because traffic safety is a *nonpartisan* matter I think we have made the mistake of thinking it was also *nonpolitical*. This is not so. Anything that has to do with legislation and legislators is political by definition. Next year we are going to organize citizens groups in the local communities to urge their assemblymen and senators to demand action in the legislature. We are going to have a people's lobby for traffic safety.

Q How will this be done?

A Quite simply. The Citizens Council on Traffic Safety has already organized a subcommittee on community action. We will work with the many organizations that already exist and try to get new ones organized where needed. As I said earlier, I am convinced the public is ready to do whatever is necessary to bring about a really big drop in highway deaths and injuries. The job of the governor is to take the lead and show how it can be done. We have already made enormous progress. As my old friend Winston Churchill once said, this may not be the beginning of the end, but we have reached the end of the beginning. STOP

Radar and other modern techniques have been employed in the enforcement program. Special emphases have greatly reduced the death toll.

The New York death rate has declined for three years, proving that drivers respect such stiff enforcement measures as license revocation.

DANGER ON TWO WHEELS

by Bob Eastman

"I WOULD rather see my son driving a souped-up hot rod than one of those suicide wagons!"

This statement was made to me by a parent as we stood at the scene of a motor scooter-motor vehicle accident watching the ambulance attendants load a battered and bleeding 14-year-old youth for a trip to the hospital.

Those who are dedicated to accident prevention have thought seriously about the motor scooter or motorized bicycle problem. We can't, for example, overlook Minnesota's special study showing 79 per cent injury and 2 per cent fatality in accidents involving the two-wheel vehicles. Nor the Los Angeles study showing one death and 169 injuries in 175 motor scooter accidents in a one-year period!

High Injury Ratio

Most safety specialists are agreed that the injury-to-accident ratio of the vehicles is fantastically high and that they present a special problem of licensing, education and enforcement. There is not, however, such general agreement on the methods to be used in seeking the objective of accident prevention.

It has been my personal opinion that the motor scooter is basically dangerous no matter how astute the operator. It is a two-wheeled vehicle which immediately presents a problem of balance. It is generally equipped with inadequate brakes, lights and horn. It is extremely light in weight with a poor center of gravity and small wheel surface, making it difficult to control. The problem of excessive speed and dual riding is well known and simply adds to the basic danger involved.

Faced with the above facts of engineering, many states, including my own state of Oklahoma, have compounded the felony by passing special legislation allowing youths 14 years of age to operate motor scooters. Here, the legislators have lost sight of their own youth. When I was 14, for instance, I jumped off the roof of my garage with an umbrella to see if it would break my fall like a parachute. After these wounds healed, I joined other 14-year-olds in building a tree house in the uppermost branches of a large oak in our back yard.

I was no more courageous than any other kid of that age. It seems to me being 14 is not an age—it's a condition! Danger (and possible loss of life) is certainly not a deterrent to hazardous activity in a mind of that age. As a matter of fact, psychologists tell us it doesn't really begin to have meaning until after 20. Then life becomes progressively more precious as the years accumulate.

Records of police departments have shown that even with well-equipped motorcycles operated by competent drivers, the accident experience is high. Part of this is due, it is believed by many, to the very fact that a small two-wheeled vehicle is more easily maneuvered in and out of traffic with a false sense of security, and the operator takes greater chances the more experienced he becomes. What he fails to realize is that, unlike the four-wheeled motor vehicle, one accident with his two-wheeled cycle is all it takes, and the rider of the unprotected vehicle is almost certainly injured or killed, even in a relatively minor collision.

It is also my belief that the motor scooter industry itself must share some of the indictment. A bit of personal research has proved that many dealers, with or without the consent of the manufacturers, have been busily convincing parents that their machines are as safe as a baby buggy. One dealer bragged that his scooter "will do 50 m.p.h. with complete safety." Another, when questioned about the lack of a front light as standard equipment, stated: "We can sell you one as an accessory, but they aren't much good, and you don't really need one anyway."

In the enforcement field, one major difficulty faced by many states and communities has been in prosecution of 14- and 15-year-old youngsters who, in some states, are below the age of legal responsibility. Oklahoma has changed this by giving courts the right to prosecute, for traffic violations, any legally licensed operator. Oklahoma City added control by prohibiting double riding. Enforcement still remains a problem because of a lack of parental concern. After all, weren't the parents assured by the dealers that the motor scooter was a safe vehicle?

Restrict Age Limit

What is the answer? As in almost every safety problem, there is no panacea. Certainly one obvious step is to allow no one below driver-license age to operate any motorized vehicle. Another must be undertaken by the motor-scooter industry to police its own house. It must have a clear understanding with all dealers that a loss of franchise will result from selling a vehicle without all recommended safety equipment, or selling to an underage operator.

Dealers should also be required to distribute to customers a brochure outlining the potential dangers of the vehicle in a realistic manner, together with statistical information sufficient to convince the operator of the need for constant vigilance.

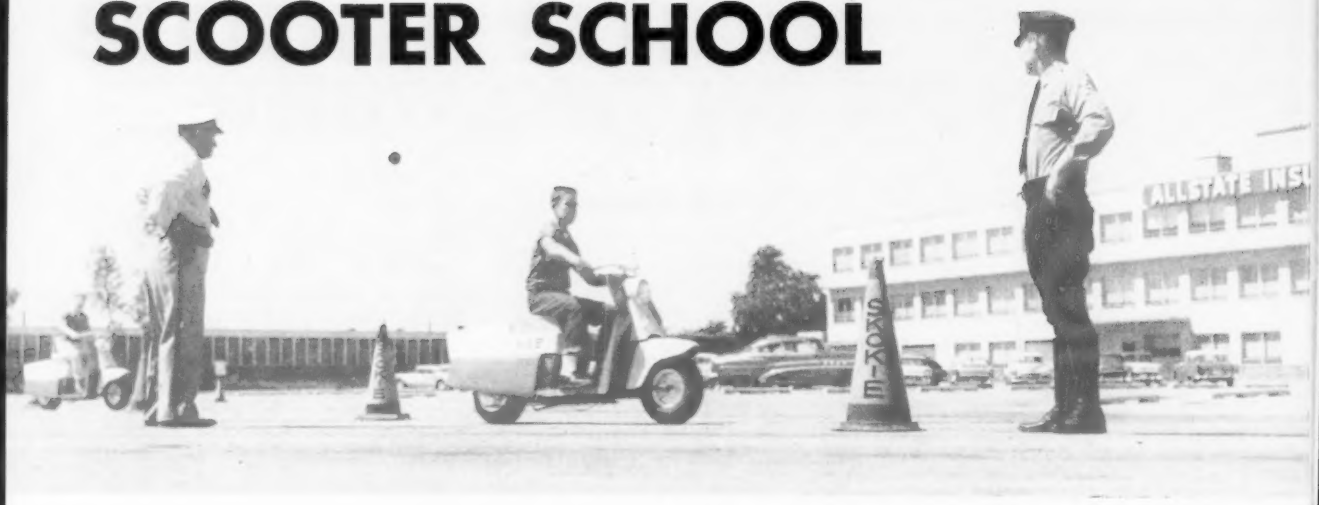
Finally, enforcement agencies and courts must be given complete jurisdiction over the scooter operators,

To Page 42

TURN THE PAGE to see how police of four Chicago suburban communities teamed up with a motor scooter manufacturer to conduct a special school for young scooter drivers. Similar schools designed to teach 14- to 16-year-olds scooter survival techniques are scheduled throughout the country.

Bob Eastman is manager, Oklahoma Safety Council.

SCOOTER SCHOOL



THE scooter fleet gathered slowly in the parking lot of the new Skokie, Ill., police and court building on a bright Saturday morning in mid-June. The clucking of their five-horsepower motors died one by one as riders wheeled into the lot and parked in orderly rows.

There were sparkling Cushman models built in Lincoln, Neb., streamlined Vespas from Genoa, Lambretta makes from Milan, models with jawbreaker names from western Germany, and a few washing machine component jobs from home workshops.

The young pilots, the motorists of tomorrow, their faces choir boy bright, wore levis and jackets, saddle shoes or boots. A few were streamlined with duck tail haircuts, others were of the flat top or skull top school, and a few had the Presley long hair look. They trouped off to the handsomely designed courtroom on the second floor to register and begin class instruction. It was scooter school time in Skokie.

A new Illinois law exempting scooter riders from virtually all regulations became effective January 1, 1958. By early summer, to the consternation of police and safety officials, streets of Chicago and suburbs were swarming with scooter addicts. The Illinois law may be amended during the next legislative session, but at the moment enforcement officials have their hands full.

The Skokie school was conducted by police of Skokie, Lincolnwood, Niles and Morton Grove in cooperation with the Cushman Motor Co. in an effort to teach drivers aged 14 to 16 the basic traffic facts needed for survival. Similar schools have been held in Flint, Mich.; Fort Lauderdale and Miami, Fla.; and Arlington, Texas. Others are scheduled in numerous other communities.

SKOKIE Chief William Griffin greets scooter riders. Three hours of classroom work were devoted to study of Illinois traffic laws, driver responsibility, riding tips, vehicle maintenance, and a scooter film.

MOTORCYCLE officer John Childs gives 36 students tips on safe riding during second Saturday session of school held in large parking lot. Hazards of loose gravel, leaves, or oil on roadway were explained.

RIDERS had to negotiate driving course without error to receive driving certificate from their police chief. Instruction stressed obedience to all traffic regulations, and the importance of mature behavior.

IMPORTANCE of knowing the limitations of bikes and scooters was pounded home. Braking and stopping distances and hazards of inattention were emphasized. Question periods followed each session.

SCOOTERISTS learned to drive at a steady speed, ride a straight line without a waver, negotiate a "slalom" course without touching a pylon, and to give proper hand signals in all situations.

JUSTICE of the Peace Albert Baumhardt gives young rider card attesting he has completed the course. Scooterists signed safe driving pledge before taking it to their police chief for his approval and signature.

Can Scooter Operators Get Insurance?

WHAT liability risks do parents take when they give permission for their sons to own and operate motor scooters and motorbikes? Do public officials understand the insurance overtones of the growing scooter craze?

The editors of TRAFFIC SAFETY sought the answers from spokesmen for insurance companies and associations. They found these starting facts.

Companies insuring risks inherent in unlicensed motor scooter operation will be difficult to find.

Some officers of insurance companies—stock, mutual and independent—said unequivocally that they would not accept such risks. Others said they would take such risks only in compulsory insurance states when assigned by an assigned risk plan. One large company is accepting such business on a selective basis, if the parent or guardian appears to be a good risk, but is limiting such contracts to an acceptable proportion of its total auto business.

A new law in Illinois permits unlicensed operation by 14-year-olds of vehicles of 5 h.p. or less. The law gives only permission to operate; it does not concern itself with the all-important question of insurance, and the risks are not assignable under the Illinois Automobile Assigned Risk Plan.

Eligibility for insurance hinges on the fact that in most jurisdictions a motor scooter or motor bike is a motor vehicle. Operators of the prescribed age and with an operator's license may apply for insurance under the regular provisions for motor vehicle coverage, or in the case of under-age juveniles, the parents may apply.

But for parents of juveniles below the licensing age for autos the insurance verdict on scooters is not so clear. Many insurance authorities feel that parents are gambling their economic future if they let junior operate a scooter without making sure of the insurance facts.

NUNS HEAR SAFETY EXPERTS

Educators gather at St. Mary's College to discuss role of teacher in traffic safety

MORE than 900 nuns representing 14 different religious orders from all parts of the country met at St. Mary's College, Notre Dame, Ind., on July 12 for the first annual national traffic safety conference for Catholic schools.

The meeting, which was conducted in cooperation with the Indiana Department of Public Instruction, the Indiana Office of Traffic Safety, and the American Bar Association, was planned for nuns attending summer school sessions in the Indiana, Michigan and Illinois area.

The sisters heard Gen. George C. Stewart, executive vice president of the National Safety Council, and other safety experts stress the need for moral counsel to youth behind the wheel.

General Stewart asked for intensified teaching of the commandment, "Thou shalt not kill." He quoted the address of Pope Pius XII on the necessity of inculcating in everyone a sense of grave responsibility for the lives of others. He also cited the statement of the Catholic bishops on traffic safety.

Dr. Arthur L. Conrad, director of the traffic education and safety division of the Municipal Court of Chicago and a trustee of St. Mary's, was originator of the plan to conduct traffic safety conferences for teachers attending summer sessions. He was one of the speakers.

Dr. Conrad said the lax traffic attitudes so widely exhibited today are a reflection of a weakening of the moral fiber of the nation. He said this deterioration, which is also evident in government, business and labor, must be counteracted by education that stresses moral responsibility.

Judge Raymond P. Drymalski, chief justice of the Municipal Court of Chicago, spoke on traffic law enforcement and American justice.

Sister M. Madeleva, C.S.C., president of the college, greeted the delegates. She told them that St. Mary's was probably the first women's college to have a course in driving, having offered it as far back as 1915. Sister Madeleva also spoke at the conclusion of the conference. She said she was much impressed by the zeal of the safety leaders taking part in the meeting, and stated that the conference had given her a deep appreciation of the importance of driver training as an integral part of education.

The all-day conference summed up the role of the Catholic sister in traffic safety education. The morning session covered the scope of traffic safety; chairman was James P. Economos, chairman of the traffic court division of the American Bar Association. In the afternoon, safety education through schools was discussed. C. Wesley Dane, director of the division of school traffic safety education, Indiana Department of Public Information, was chairman of this session.

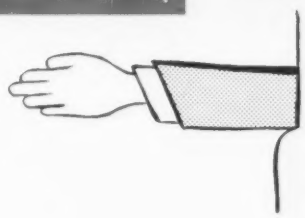
Allstate Insurance Co., the Hoosier Motor Club and the Chicago Motor Club were luncheon hosts to the delegates.

SISTER MADELEVA, president of St. Mary's, chats with General Stewart.

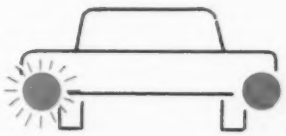
ON THE CAMPUS GROUNDS, a group of sisters watch a demonstration on the proper techniques for teaching driver education in schools.

WHAT YOU SHOULD KNOW ABOUT... USE OF TURN SIGNALS

TO make a safe turn in the old days a driver just put his arm out the window. But when his wife came up with electric gadgets that took "drudgery" out of housework and "dishwater" out of hands, he wanted something to take the arm out of signaling. To free him from the coarse red highway hand—auto makers came up with . . .



BRIGHT mechanical turn signal lamps. In the change-over, safe driving—in many instances—was short circuited. Some drivers now cruise along, their turn signals flashing, without any intention of turning. This makes the driver behind nervous. Turn signals should speak clearly—reassuringly. Here's the way.



KNOW THE LAW

Most states and cities have adopted turn signal laws in conformance with the Uniform Vehicle Code. The UVC lists these rules for turning:

- **GET IN POSTION**

  Don't turn unless you can do it with reasonable safety. That means you must look ahead, decide where you want to turn and be in a position to turn when you get there. This applies to intersections, traffic lanes, private roadways and driveways, and passing cars.

- **MAKE THE SIGNAL IN ADVANCE**

  Give a continuous signal for a distance of at least 100 feet before turning.

- **DON'T SURPRISE**

  Don't stop or suddenly decrease speed without giving an appropriate signal unless there's an emergency.

- **KEEP YOUR HANDS**

  There's no law against using your arm and hand to make a turn signal. But signal lamps are required when: the distance from top of steering post to the left outside limit of the vehicle body exceeds 24 inches; the distance from center of top of steering post to rear limit of vehicle body or load exceeds 14 feet.

- **YIELDING THE RIGHT-OF-WAY**

  Driver intending to turn left who is already within intersection should yield right-of-way to approaching vehicles within intersection or close enough to be a hazard. Having yielded right-of-way, driver may then turn and any approaching vehicles should yield right-of-way.

DRIVERS SHOULD ALSO:

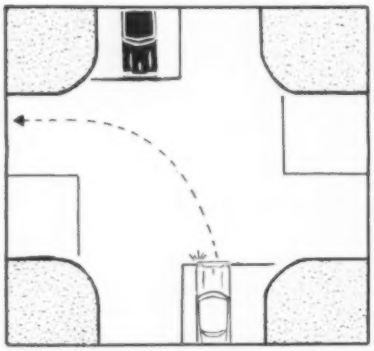
- Be alert for unexpected actions of other drivers.
- Make sure they don't behave unexpectedly themselves; flashing turn signals to change lanes is not enough—check traffic first.
- Check mechanical turn signals periodically to be sure they're working.
- Make certain turn signals are not flashing when there is no intent to turn.

GOOD RULE AT INTERSECTIONS

Any pedestrian or vehicle in, or about to enter, intersection has right-of-way over vehicle making the turn.

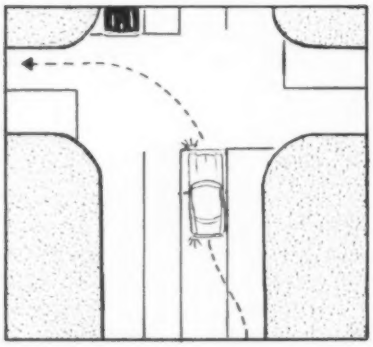
[SPREAD THE FACTS—Reprints of this fact sheet are available from NSC. Or it may be planographed in your community. See page 26 for details.]

HOW TO MAKE LEFT TURN



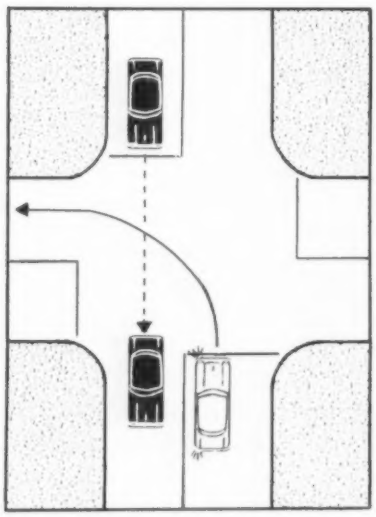
← ON TWO-LANE ROAD

Driver moves to extreme left of lane to make turn; thus he warns other motorists that he intends to turn left. At least 100 feet before turning he starts giving continuous turning signal and slows down.



← ON FOUR-LANE ROAD

Turn must be made from left lane; thus driver should plan transfer from traffic lane in advance of turn, making it with extreme care and signaling if necessary. At least 100 feet before turning he starts giving continuous turning signal and slows down.



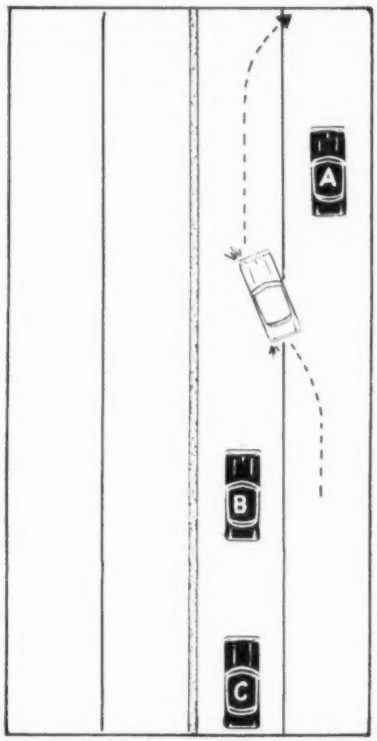
← TURNING

*Don't turn too soon. Driver must keep to right of center line at cross walk of street he is leaving.

*When driver leaves intersection after turning he should enter to right of center line of roadway.

*When possible the left turn should be made to the left of the center of intersection.

*Remember—any pedestrian or vehicle in or about to enter the intersection has right-of-way over vehicle making turn.



↑ WHEN PASSING

Cars A, B and C are traveling about 40 m.p.h. on a 4-lane divided highway with posted speed limit of 45 m.p.h. To pass A the driver should:

- Make sure there's enough roadway between B and A
- Then signal informing B and C he intends to pass A and will be in their lane.

FOR RIGHT TURN—observe same general rules, but keep as close to right as possible when approaching intersection and when turning.

UTAH'S DAMAGED VEHICLE RELEASE PROGRAM

by Lyle Hyatt

WHEN Utah's accident reporting spurted to a 146 per cent increase this January, nobody in the highway patrol had any illusions about the sudden high quality of reporting, or the public acceptance of the need of accident reporting. We simply chalked up another gain for the damaged vehicle release program which we began last November.

The increase of 146 per cent in reporting experience should not be regarded as a sudden upsurge of accidents in the state of Utah. The enormous increases for the months listed simply mean that the state had been experiencing this number of accidents but that no reports or investigation had been made regarding them.

The damaged vehicle release program had its inception in 1957 when the Salt Lake City Police Department requested the state highway patrol to initiate on a statewide basis a program they had under way citywide.

Garage Owners Reported

The Salt Lake City Police Department had, for some time, in effect, a similar program, except that a sticker for the damaged vehicle was not used. Garage owners in Salt Lake City were required to report on a form all damaged vehicles taken in by garage owners for repair. The biggest problem encountered by the Salt Lake City Police Department was that vehicles involved in accidents outside the city limits were brought in for repair with no report as to circumstances regarding the accident.

Some time in August of 1957, their department contacted the Utah Highway Patrol to see if it would be possible to place their program on a statewide basis which could only be accomplished through the assistance of the highway patrol and the city and county officers throughout the state.

The author is superintendent of the Utah Highway Patrol, Salt Lake City, Utah.

Knowing of Denver's damaged vehicle release sticker, it was felt that such a program might be adapted to the entire state of Utah. Damaged vehicle release stickers similar to the ones used by the city of Denver were designed and printed in the initial number of 50,000 and numbered in series in order that an accurate check could be kept on which department was using which series, how many had been used, etc.

On November 11, 1957, it was announced to the press and all garage owners that this program was now in effect. Two sections of Utah law made the program possible. They are as follows:

41-6-35. Accident reports—Duty of driver, witnesses and investigating officer to forward or render—Supplemental reports.

(a) The driver of a vehicle involved in an accident resulting in injury to or death of any person or total property damage to an apparent extent of $25 or more shall, within five days after such accident, forward a written report of such accident to the department.

(b) The department may require any driver of a vehicle involved in an accident of which report must be made as provided in this section to file supplemental reports whenever the original report is insufficient in the opinion of the department and may require witnesses of accidents to render reports to the department.

(c) Every law enforcement officer who, in the regular course of duty, investigates a motor vehicle accident of which report must be made as required in this section, either at the time of and at the scene of the accident or thereafter by interviewing participants or witnesses shall, within 24 hours after completing such investigation, forward a written report of such accident to the department.

41-6-39. Garage keeper to report damaged vehicle.

The person in charge of any garage or repair shop to which is brought any motor vehicle which shows evidence of having been involved in an accident of which report must be made as provided in Section 41-6-35, or struck by any bullet, shall report to the department within 24 hours after such vehicle is received, giving the engine number, registration number and the name and address of the owner or operator of such vehicle.

In other words, the success of this program was contingent upon the cooperation of the garages, who were bound under Utah law to report damaged vehicles. Enforcement was, therefore, directed for the most part toward these establishments instead of the individual driver.

Driver Reports Accidents

Under the first section above mentioned, however, the driver must report such accidents, and in several cases since the inception of this program, they have been arrested for failing to do so.

Garage and repair shop owners are very cooperative and happy to assist in this program because it relieves them of the necessity of contacting a police officer each time a damaged vehicle is brought to their establishment for repair. If the damaged vehicle does not have one of our stickers on the windshield, the garage owner merely refuses to repair it until one has been obtained.

What followed was to be expected. Police departments in the state of Utah were swamped with requests by the public for damaged vehicle release stickers. Vehicles which had been damaged months previous to the inception of this program had to be checked by an officer before garage owners would repair them. At the present time most of this backlog of damaged vehicles has been taken care of and the entire program has begun to level off.

In addition to a large number of hit-and-run drivers who were apprehended as a result of this program, accident reporting has increased enormously throughout the state. This, of course, gives us a much better accident picture within the state. Following are data on the results of this program

To Page 39

HOW MOTORISTS GAMBLE AT RAILROAD CROSSINGS

by Ralph R. West and Gordon Jeffery

The Ohio State Safety Council and the Ohio Department of Highway Safety recently sent a party of writers and a photographer aboard the engine of a crack passenger train to get a first-hand look at the railroad crossing problem. Their story documents the carelessness and dare-devil stunts of automobile drivers which result in a fantastic toll of needless human death and destruction across the nation.

HOP aboard a crack Pennsylvania passenger train with the engineer and you soon see his job is more than enjoying the beauty of the countryside, the fresh air, the corn fields and open pastures.

It isn't long before you catch sight of a car in the distance bearing down on the tracks ahead. It doesn't look as if it's going to stop. You catch your breath as the engineer blasts on the whistle. The car stops at the red flashing lights 100 feet down the track (we're doing 60), checks to see how close our train is, the driver guns his motor, then zooms across the track with a puff of exhaust.

This Gambler Lost in Tie

You catch yourself wondering what kind of a mental patient was in the driver's seat. But you soon find out he wasn't a mental case, he wasn't a criminal, a bum or hot-rodder. He was simply one of the hundreds of rushing Ohioans who gamble with suicide and mayhem at grade crossings.

Most of these drivers are parents who probably scold their youngsters when they play dangerously with their toy trains.

From crossing to crossing you hold your breath in tense suspense. It's about like riding a roller-coaster in an amusement park. The engineer is constantly on edge. Perhaps the driver gets some sort of thrill. But the results of 544 collisions of car and train last year in Ohio are not amusing drama.

One hundred and fifteen persons were killed. Some 295 who were injured will have a train and track number seared into their memory for a lifetime.

What we saw made us marvel that collisions of vehicles and trains are not more frequent. Even those cars which did stop to let us go by, did not seem to leave an extra inch of clearance.

There was plenty of evidence in support of the engineer's claim that "when the flashers start up, everyone guns his motor to beat us across."

Enginemen attach HOPE to the railroad-highway crossbuck warning sign, "STOP, LOOK AND LISTEN." They seem to have a little more confidence in crossing gates. While we did not see a car drive around a gate, which is a specific violation of a state traffic law, the crew told us it is a rare day when they do not see such a violation.

Ralph R. West is president, Ohio State Safety Council, and Gordon Jeffery is director, Ohio Department of Highway Safety.

The crewmen were correct. We did have a totally different view of the situation. Buildings cluster close to the tracks. Your first impression of a community of any size—city, village, or hamlet—is that you are running between two walls, beyond which you cannot see. There are openings in those walls where streets cross. You catch yourself wondering if anything will dash through that next opening onto the track in front of you.

Motorists who complain about *their* vision being restricted should pity the engineer. He can't see as well as they can. Often a glint in roadside vegetation may be the first hint that a car is approaching the track. Is he going to stop?

Few motorists ease up when they see the advance warning signs posted on the highway 500 feet from the crossing. We were never sure until the last second, whether they intended to stop or not. The state highway department thinks the signs are important. They think the taxpayer's life is worth $48,000, the cost of posting these signs at 2,400 grade crossings on the state highway system.

You begin to wonder about these drivers' daring hopscotch with sudden death. It's elementary trains don't gallop or buck. Tons and tons of surging steel propelled by 20,000 horsepower can't dodge on a couple of three-inch rails.

If the car should stall on the tracks while the driver is shifting gears to gun his motor, if his calculations of the train's distance and speed are in error, if he should suddenly become paralyzed with fear—train hits car—the driver loses the sensation of having extra time for a lifetime.

The engineer is interested in saving lives. He does not hold life as cheap as the motorist who gambles with his own. He has to think of the safety of his train and more important, his own precious cargo of passengers.

A train going 60 miles an hour cannot stop within a quarter of a mile without putting the air brakes into emergency. Any motor vehicle in fit condition for the highway requires less than one-third of that stopping distance.

The engineer explained that there is a great chance of derailment and jarring sensation to the train should he put the air brakes in emergency to stop. He added the chances of fire and derailment are greater at lower speeds.

You talk to the "white collar" railroad men at the regional office and find them quite concerned. One of them is hopping mad about letters that come in periodically from drivers suing the railroad for nicking a fender.

They Crashed Lights

In nearly half of Ohio's railroad crossing collisions motorists had to drive through red flashing lights (181), around gates (48), and watchmen (42)—to crack up with a train!

"We put an average of $15,000 into red flashers at crossings. Sometimes they run as high as $60,000. We pay the watchmen to stand duty. And then some individuals have the nerve to sue us for clipping them."

The railroader said he'd like to give these drivers engraved invitations to have the personal job of helping to remove the human wreckage from an accident.

"It's not very pretty. They should have the opportunity of getting sick like we do." The angry man behind the desk thought it might shake them up.

"Maybe they might decide to inconvenience themselves to stop and wait for us to go by.

"Maybe."

Ohio Rail Crossing Safety Program

- The Ohio Safety Council's railroad division issues a monthly safety bulletin which goes to daily and weekly newspapers and radio stations. Large quantities also go to the safety officers of participating railroads who distribute them to key people for discussion in employee safety meetings. Major emphasis is given the grade crossing and trespassing problems.
- During at least one month of each year a railroad has its personnel observe grade crossings along its right of way. The observer reports to the council outstanding examples of compliance with or violation of Ohio law which forbids a motorist to enter a crossing when the approach of a train is imminent.

  When a company vehicle is identified, an appropriate letter commending the driver—in the event of significant compliance of the law—goes to the firm. Should a violation be reported, the letter attempts to persuade company officials to admonish their drivers to approach crossings cautiously and properly.
- Most of the railroads report grade crossing occurrences along their right-of-way to the council. These reports are tabulated and classified with periodical reports going to the railroads listing counties with high frequencies. These reports serve as a guide to the railroads in their crossing observation program.
- For the past six years, there has been a Highway Rail Crossing Accident Prevention Week, usually the last week in April, in which the Department of Highway Safety, the Ohio State Automobile Association, Ohio Trucking Association, Buckeye State Sheriff's Association, Ohio Chiefs of Police and a number of other agencies participate.
- The media are provided with large quantities of special material for this week. The Department of Highway Safety produces a special poster printing of about 25,000. Most of these are distributed through the department's normal channels with 4,000 supplied to the railroads for display on their properties where the public might see them. Two thousand are distributed through the safety council to other organizations.

HOLIDAY HORROR

You can cut Christmas time traffic deaths in your town. Here's how two cities did it.

WE kill more people in traffic during December than any other month of the year.

What happens? What gets into people as our great Christmas holiday season approaches?

Traditionally it is a time of great happiness. The atmosphere abounds with love of fellow man and good cheer. It should not be a time of death or pain and grief, but it is. People get all wound up with the season and step right out into eternity. They are grimly determined to wring the last full measure of happiness out of the last days of the fading year . . . even if it kills them.

It is a time to forget the miserable breakdown of big plans, the collapse of great projects, and the shambles the days of the year have made of fine resolutions. A new clean slate is going up. The small warning voices of survival are drowned out by the crashing of falling inhibitions. Then there is a goof-up in traffic . . . and BLAM!

There are four factors which make December the deadliest month of the year, and Christmas Eve day almost always the year's "most fatal day" in traffic. These are alcohol, speed, darkness, and pedestrian errors.

Add to these the bad weather experienced in most areas, the carelessness and hurry induced by holiday festivities, the mad scramble to complete shopping chores, and the increased number of hours of darkness and you have real trouble.

In handling this annual problem you have a choice. You can pass out some literature, schedule some radio and TV spots, and then stand by and watch the accident experience repeat itself as it has year after year. Or you can start now to build a program of education and enforcement which will do a job.

Study the following programs which have proved so successful in Chicago and Detroit and in many other cities. Adapt them to your use.

Chicago's "Operation Life Saver"

Last year Chicago passed through the two-day Christmas holiday period with only one traffic death. December deaths dropped from 57 in 1956 to 34. In 1956 during a five-day holiday, 17 were killed. Over the three-day 1955 Christmas holiday there were 16 deaths. In 1954, a two-day holiday, 11 were killed.

Comparing daily averages, traffic deaths in 1957 when the following plan was in operation were reduced 89 per cent from the daily average during Christmas seasons in 1956, 1955 and 1954.

Here's how they did it.

▸ Education Phase

- Christmas Eve day was target date. In September, four months in advance, Commissioner Timothy O'Connor urged through the press and radio that all firms ban liquor at office Christmas parties.
- Officers of the Traffic Division's Public Safety Education Unit began contacting industries in police districts to which they were assigned to ask management to refrain from serving liquor at office parties. More than 1,000 companies were canvassed and 90 per cent agreed with the proposal.
- Two million leaflets on the subjects of bad weather driving, poor visibility, pedestrian protection and drunk driving were distributed throughout the city.
- Newspaper articles, advertisements, radio and television, car cards and posters were used to warn people of winter and holiday hazards.
- On Christmas Eve day, officers were stationed in garages and parking lots and in restaurant and night club areas to question anyone who appeared about to drive while in an intoxicated condition. They called cabs for celebrators and parked cars for them, or persuaded a sober mem-

ber of the party to take the wheel. If persons refused to leave their cars when requested by officers, they were arrested.

▸ Enforcement Phase

- The Traffic Division's Statistical Unit analyzed all accidents which had occurred during the previous holiday period and compiled lists of major violations charged and times and places accidents occurred.
- This information was sent to all police commands dealing with traffic supervision.
- Commanders assigned additional manpower to sections of streets which the study showed would probably be most productive of accidents.
- Scheduled days off were canceled to keep all mobile units rolling.
- Special radar units were assigned to streets where speed violations were predominant.
- Red flasher lights, the "dome" lights and three-wheeler lights were kept on during the holiday period.
- Supervisory personnel at command posts maintained a 24-hour watch to keep on top of any developing situations which might cause congestion and increase accident potential.

Success of the Chicago program stems in part from the ability of the Citizens Traffic Safety Board and Chicago police to obtain help and support from industries and organizations of all kinds. Churches, clubs, social and fraternal groups offered to act as channels of distribution for traffic safety leaflets and other materials.

Jail sentences and heavy fines for drunk drivers were other important deterrents.

Chicago police will use "Plan-H" for all holidays. They are no longer faced with the necessity of developing a new program every time another holiday rolls around. Time can be spent discussing special and supporting programs. The plan was first used successfully during the July 4 holiday. It was used on Labor Day with equally impressive results.

Detroit Sends Drunk Drivers To Jail

Detroit holds holiday accidents to a minimum by a well-rounded educational and enforcement program which is given tremendous impact by a highly publicized policy of sending drunk drivers to jail.

Last year, as they have done for many years, traffic judges George T. Murphy and John D. Watts issued a policy statement concerning drunken and drinking drivers. The statement read in part:

"All drivers convicted of drunken driving during the holiday season will receive straight jail sentences without the alternative of paying a fine. Such persons, under state law, also automatically lose their licenses for 90 days and must establish financial responsibility before they can get them back.

"In other violations where drinking is a factor, those convicted can be certain their sentences will be more severe than if no drinking was involved."

The Detroit program pays off. The city cut its December death toll by 50 per cent last year. There were only 14 deaths during the month. The average over the years has been about 27 traffic victims.

Here's how the city's officials and civic leaders operate.

▸ Educational Phase

- Traffic Safety Association posters on 1,000 street-side standards in the Detroit area repeat the warning that "Drunk Drivers Go to Jail."
- The same message on 11,000 small posters is placed in all bars, state liquor stores and public buildings.
- More than 35,000 circulars detailing December traffic hazards are distributed to all major Detroit office buildings. Building managers distribute them to desks of all building residents.
- The department of street railways posts special warning notices for pedestrians.
- Newspapers, radio stations, and television stations remind drivers and pedestrians of December hazards with a steady stream of educational stories, announcements and programs.

▸ Enforcement Phase

- Assignment of traffic law enforcement units is shuffled to place larger patrols on streets during peak accident periods.
- To help control night-time accidents, 107 motorcycle officers are on duty all day Friday and Saturday during December, and on Monday and Tuesday before Christmas from 3 p.m. to 2 a.m.
- Every major shopping district has a special patrol and other units are assigned on the basis of accident experience.
- All enforcement units from both precinct and traffic division commands are ordered to give special attention to:

1. Violations of the Pedestrian Protection Ordinance.
2. Motorists who fail to yield right-of-way to pedestrians.
3. Motorists and pedestrians who have been drinking and who violate traffic laws.

POSTERS WARNING the public that "Drunk Drivers Go to Jail" are placed in Detroit bars, state liquor stores and public buildings.

HOLIDAY HAZARDS

WHERE do you celebrate Christmas? Beside the family tree, in a church pew, or on a barstool? That's your concern. But how you get there is the public concern. Your community should know and implement the "words and actions" of safe holiday driving. They come from:

THE PULPIT

. . . where the lone safe driving sermon is being supplanted by a continuing safe driving crusade. When clergymen stress the moral responsibility of careless driving they do it together. Their "thou shalt not kill on the highway" appeal is community wide, planned in advance and may continue for 30 days before a holiday. Some governors are calling official safe driving Sundays under the crusade banner. This is a great field for cooperation of public support groups.

THE POLICE STATION

. . . where "selective enforcement" is key to the crackdown on holiday accidents. Reports on high accident areas go out from the traffic division's statistical unit, and traffic command personnel move in to avert accident causing situations and curb law violators. That means your community needs adequate accident reporting methods and enough men to do the enforcement job efficiently. Support and foster improvements in your police traffic division.

THE BOTTLE

. . . where many highway cads get their start. The whiskey bottle doesn't talk—but it moves authorities to act. Holiday alcoholics are likely to be stopped by policemen before they even get in their cars; there's a friendly request not to drive—or the alternative, arrest. The alcohol hazard can be fought by not serving liquor at holiday office parties, by putting drunks in taxis instead of their cars and by public support of police efforts.

THE SAFETY ADS

. . . posters, pamphlets and stickers, these are part of the approach to holiday safety. Their areas of distribution—everywhere: stores, factories, office buildings, homes, restaurants and bars. It might take a volunteer worker an afternoon or week of pavement pounding to distribute his quota, but one of those printed reminders may save a life or prevent a lifetime injury.

THE MASS MEDIA

. . . where the best exhortation to safe driving comes the morning after, when the traffic death toll is headlined. Cooperation of radio, TV and newspapers with safety groups and officials has spelled success for many a holiday hazards campaign. These media are well qualified to impress upon the public that it only takes an extra drink, a heavy foot or a careless turn of the wheel to become a page one fatal.

THE NOISY NIGHT BEFORE CHRISTMAS

Screech, boom, bang—the streets of the nation rang out Christmas Eve, 1957.

Motorists died at twice the rate they died Christmas Day. The first holiday hour was the worst; more fatal auto accidents than in any succeeding hour; more pedestrian deaths, too.

Why did the holiday dance of death kick up a clatter so soon? Partly because half-tipsy thousands streamed home from office parties haphazardly and hazardously.

Partly because sober workers heavy-footed the gas pedal in the dash home.

What was the result?

An average of 12 deaths an hour from 6 p.m. to midnight, Christmas Eve, compared with less than five deaths an hour during the next 24. Twenty-five fatal auto accidents, including nine pedestrian deaths during the first noisy hour.

HAVE YOU GOT MURDER IN YOUR HEART?

Yes—if you read this—then drink more than two cocktails or bottles of beer and drive a car.

Because — according to reliable studies, your chances of getting in an accident are three to 10 times greater than they would be if you stopped at one cocktail or one bottle of beer.

But—if you're a person who gets fuzzy after just one cocktail and drives a car, then you're a potential killer, too.

Reprints of this fact sheet

365..

. . . days of expert driving, walking and enforcement are needed each year to help keep down the traffic death toll on just a few annual holidays. Four factors—alcohol, speed, darkness and pedestrian errors—contribute to that toll all year, but on holidays their death-dealing capability is multiplied by the rush and excitement. Right now you may have only 120, 60 or 30 driving days left until Christmas; but it's enough time to start getting in the habit of saving lives. Begin by observing these driver-walker rules:

DRIVERS:

- Come to a complete stop at stop signs.
- Don't drive or walk in traffic after drinking.
- Follow other vehicles at a safe distance.
- Stay alert; don't daydream about holiday doings.
- Slow down in bad weather; adjust to conditions.
- Dim lights on highway even when oncoming driver doesn't. Look at right shoulder to keep control.
- Yield right-of-way to pedestrians in crosswalks. Don't pass a car stopped to let a walker cross.
- Stay on own side of road at intersections, grade crossings, no-passing zones, on hills and curves.

WALKERS:

- Obey traffic signals and signs.
- Cross at intersections ONLY.
- Look left and right for traffic while crossing.
- Watch for turning cars before stepping off curb.
- Never walk into street from behind parked cars.
- If you must walk on road, walk on left facing cars.
- Wait on sidewalk, not in street, for green light or "walk" or gap in traffic where there's no light.
- At night wear or carry something white or reflectorized to help driver see you.
- While crossing streets don't obscure your view with packages, an umbrella or hat.

are available. See page 26.

ALCOHOL

Of adult pedestrians killed in 1957 had been drinking.

Of all fatal accidents in 1957 involved drinking drivers.

Of accidents in a 1957 Christmas holiday study involved drinking drivers.

SPEED

38 *per cent of fatal accidents in 1957 involved speed too fast for conditions.*

72 *per cent of fatal accidents in a 1957 Christmas holiday study involved speed too fast for conditions.*

DARKNESS

- **55** per cent of all fatal accidents in 1957 occurred at night.
- Mileage death rate is 2 to 3 times as great at night as in daylight, according to National Safety Council estimates.

PEDESTRIAN ERRORS

Pedestrian deaths totaled 7,850 in 1957; 3000 of the victims were 65 or older.

Of pedestrian victims were crossing between intersections.

Stepped from behind parked cars.

Were killed while walking on the roadway.

BOOSTERS

USE THESE AIDS . . .

TAKING HAZARDS OUT OF HOLIDAYS IS EASIER WITH . . .

FILMS

- *Split Second*—Reaction time tests of drivers before and after one drink. (16 mm B&W, 13 min. TV/OK from North Carolina Dept. of Motor Vehicles, New Bern Ave., Raleigh, N.C.)

- *The Mixer*—What happens when teenage couple mixes drinking and driving on way to state fair. (16 mm sound motion color 10 min. loan from University of Illinois, Visual Service Div. of University Extension, Champaign, Ill.; purchase or loan from MFA Mutual Insurance Co. and Missouri State Highway Patrol, Columbia, Mo., TV/OK this source)

- *Search for Safety*—Effects of speed factor in auto crash tests. (16 mm color and B&W 27 min. TV/OK from Motor Vehicle Research, Route 152, South Lee, N. H.)

- *What Made Sammy Speed*—Personal factors and emotions behind an accident. (16 mm color and B&W 10 min. TV/OK from Sid Davis Productions, 2500 S. La Brea Ave., Los Angeles 16, Calif.)

- *Foot Faults*—Careless pedestrian gets word on careful walking. (16 mm sound motion B&W 11 min. rent from The Princeton Film Center, Inc. Princeton, N. J.)

- *Lakewood Learns to Live*—Unsafe walker dreams he's driver and pedestrian and almost loses his life. (16 mm sound motion B&W 20 min. from AAA Foundation for Traffic Safety, 1712 G St., N. W., Washington 6, D. C.)

- *How to Drive on Snow and Ice*—Safe driving principles in winter. (16 mm B&W 12½ min. TV/OK from Seiberling Rubber Co., Akron 9, Ohio)

NSC AIDS

Public Safety Memos—Authorities talk safety. Reaction Time in Automobile Driving (95), Testing the Drinking Driver (29), Setting Up Chemical Tests for Intoxication (30), Building Public Support for Traffic Police Programs (62). Include memo no. and stock no.: 329.01.

Smart Headwork for Lifesaving Footwork—Quiz booklet for pedestrians. Sixteen pages, illustrated. Stock No.: 399.52.

It's Your Responsibility — Winter Driving Facts for Passenger Car Drivers. Comprehensive guide, two colors, charts, 16 pages. Stock No.: 399.63.

How to Be a Better Winter Driver—Brief Guide to safe winter driving. Illustrated, 8 pages. Stock No.: 399.62.

Alcoholic Influence Report Form—For use by city and state traffic officials in recording objective symptoms of persons suspected of intoxication. Stock No.: 321.99.

Uses of Chemical Tests for Intoxication—Report of the Committee on Tests for Intoxication to determine degree of intoxication in suspected drinking drivers. Data from cities using chemical tests presented. 20 pages. Stock No.: 399.21.

Evaluating Chemical Tests for Intoxication—Results of a research project conducted to evaluate various chemical tests for intoxication. 16 pages. Stock No.: 329.28.

Pedestrian Warning Signs—Four-color warning strips for posting on traffic and street light poles at pedestrian crosswalks. Weather resistant and easily applied. Wait for the Walk (1) and Wait for the Green (2). Stock No. for both: 393.03.

Spread the Facts

Reprints of the two-page fact sheets on holiday hazards (No. 329.96—6), pages 24 and 25, and use of turn signals (No. 329.96—5), pages 17 and 18, may be ordered from NSC. Or they may be planographed locally. NSC reprint prices: packages of 50, $3.90; 100, $5.35; 500, $15.00; subject to 10 per cent member discount. Order by September 15.

OPERATION SAFETY: On the shelf, but not forgotten, Operation Safety is making room for Action Program and other traffic safety features. However, free single kits on themes listed below may be ordered by number.

Number	Emphasis	Suggested Schedule	Month Available
1.	Bad Weather Driving	January	October
2.	Signs of Life	February	November
3.	Defensive Driving—Moral Responsibility	March	December
4.	Traffic Laws	April	January
5.	Vehicle Maintenance*	May	February
6.	Speed Control—Slow Down and Live*	June	March
7.	Signs of Life—Vacation Driving	July	April
8.	Share the Road	August	May
9.	Back to School—Child Safety	September	June
10.	Safety After Dark	October	July
11.	Pedestrian Protection	November	August
12.	Holiday Hazards*	December	September

*These are special emphasis programs.

MATERIALS

HERE'S A NEW WINTER DRIVING SAFETY AID

The newest report of the National Safety Council's Committee on Winter Driving Hazards is presented in a colorfully illustrated, easy-to-read 8-page booklet which carries a real punch.

"How to Be a Better Winter Driver" is exactly what the title implies. Any motorist who reads and absorbs the information in this booklet should experience no difficulty in winter weather and come through the hazardous season without even a bumper scrape.

Stock Number 399.62

Prices (Sold in minimum orders of 50 only): 50-499 copies, $.055 ea.; 500-999, $.05 ea.; 1,000-4,999, $.045; 5,000-9,999, $.043; 10,000-19,999, $.042; 20,000 or more, $.04 ea.

TRAFFIC POSTERS FOR NOVEMBER POSTING

T-1444-C 25"x38"
T-1445-A 8½"x11½"

T-1446-B 17"x23"

TRAFFIC POSTERS FOR DECEMBER POSTING

T-1465-C 25"x38"
T-1466-A 8½"x11½"

T-1467-B 17"x23"

PRICES FOR ABOVE POSTERS

Traffic Posters—T-prefix to number	1-9	10-99	100-999	1000-4999*
A Size	$0.15	$0.092	$0.063	$0.052
B Size	.25	.18	.15	.12
C Size	.35	.27	.22	.20

YOUR CREDIT LINE can be imprinted at time of the press run on Traffic B and C posters only. Orders for imprints on November posters above must be received by September 15, 1958. Orders for imprints on December posters above must be received by October 15, 1958.

Imprinting charges for these posters are $2.25 per lot plus an initial charge for each electroplate of $21.00 for C poster imprint and $12.50 for B poster imprint.

*Write for prices on quantities of 5,000 or more or for special rates on annual poster orders. 1 column newspaper mats on these posters are available from the National Safety Council.

PRICES SHOWN ARE SUBJECT TO A DISCOUNT OF 10% TO NATIONAL SAFETY COUNCIL MEMBERS.

FLEET POSTERS

POSTER PRICES

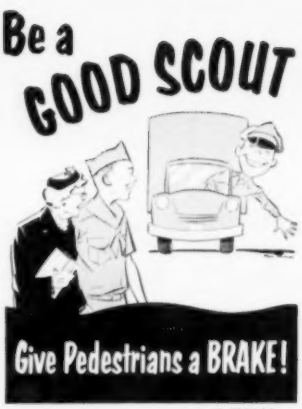
Posters illustrated on these pages are included in the automatic Motor Transportation poster services. Automatic poster sets are available on yearly subscription that provides (4) subjects per month viz. (2) "A" size (8½"x11½")and (2) "B" size (17"x23"). Automatic service is provided in the following categories:

City Truck Intercity Truck Sales Truck Truck Terminal	City Bus Intercity Bus Taxicab Bus Terminal	Annual price 1-4 sets, $8.85 per set; 5-49 sets, $7.45 per set; 50 or more sets, $5.95 per set.

Posters are available for individual selection at the following prices:

	1-9	10-99	100-999	1000-4999*
A size, any selection	.15	.092	.063	.052
B size, any selection	.30	.22	.185	.15

All prices shown are subject to a 10% discount to National Safety Council Members. *Write for prices on quantities of 5,000 or more.



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V-1441-B 17x23

PRINTED IN U.S.A.
©NATIONAL SAFETY COUNCIL

1057-A 8½x11½

PRINTED IN U.S.A.
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0772-A 8½x11½

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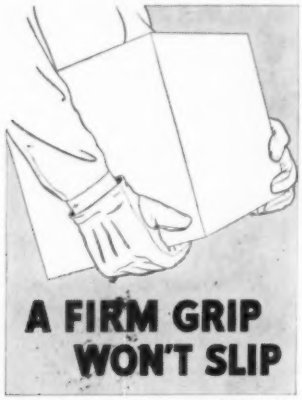
0991-B 17x23



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1018-A 8½x11½

NATIONAL SAFETY COUNCIL

8124-B 17x23

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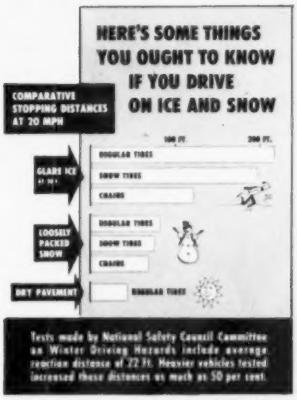
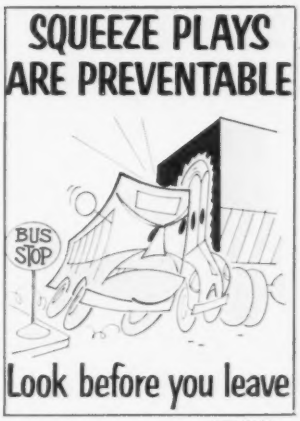
0831-B 17x23


HERE'S SOME THINGS
YOU OUGHT TO KNOW
IF YOU DRIVE
ON ICE AND SNOW
COMPARATIVE STOPPING DISTANCES AT 20 MPH
GLARE ICE
LOOSELY PACKED SNOW
DRY PAVEMENT
REGULAR TIRES
SNOW TIRES
CHAINS
Tests made by National Safety Council Committee on Winter Driving Hazards include average reaction distance of 22 ft. Heavier vehicles tested increased these distances as much as 50 per cent.
PRINTED IN U.S.A.
©NATIONAL SAFETY COUNCIL

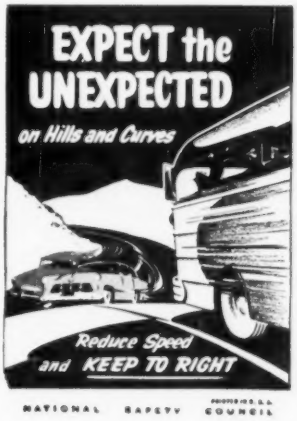
V-1442-B 17x23

A most important reason
To make sure your lights are right
Here comes the Winter season
When more of Dogs are Night.
PRINTED IN U.S.A.
©NATIONAL SAFETY COUNCIL

V-1439-A 8½x11½

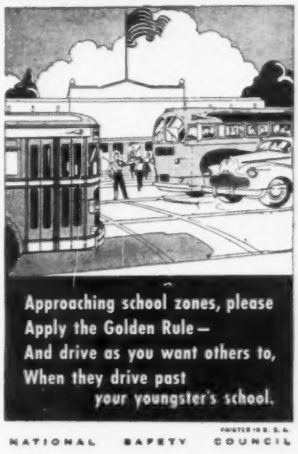


V-1440-A 8½x11½



V-0612-A 8½x11½

V-1150-A 8½x11½


Approaching school zones, please
Apply the Golden Rule—
And drive as you want others to,
When they drive past
your youngster's school.
NATIONAL SAFETY COUNCIL

V-8273-B 17x23

V-9912-A 8½x11½

V-9764-A 8½x11½

V-0578-A 8½x11½

Coca-Cola FLEET ACCIDENTS THAT DIDN'T HAPPEN

Safety program brings 78 per cent drop in accidents in seven years despite 75 per cent mileage rise

by Elmer Dupuis

In 1951 Coca-Cola Bottling Co. of St. Louis gave a new twist to the famous slogan, "the pause that refreshes." It paused to take a long, hard look at its accident record. That pause revitalized the company's safety program.

In the hectic years following the war more people than ever before were heeding Coca-Cola's advice to take time out for the "pause that refreshes." This meant increased production and distribution—and more accidents.

Rapidly rising direct and indirect accident costs—including delays, equipment damage and impaired efficiency—reached a climax by the end of 1951.

That was when department heads went into their huddle. Immediate action followed. Vice President G. Newton Cox was given direct responsibility for accident control. Edsel Hatfield was appointed safety director and Vita Zerillo was named industrial department safety supervisor. The services of a safety engineering company—United States Fidelity & Guaranty Co.—were engaged. The company became a member of the NSC and installed the Council's complete transportation service.

After that things began to happen fast. The two newly appointed safety supervisors had no previous safety supervisory training. But, working closely with USF&G's safety personnel they soon had a sound safety program rolling.

They set up a training course requiring 17 route-salesman safety meetings every four weeks. Nine of these were for the industrial department where employee turnover was high. The one-hour meetings, which were held on week days and Saturdays at 7:00 a.m., were attended by 10 to 40 men—depending on the size of the divisions or departments.

This schedule has changed a little over the years. Saturday meetings have been discontinued. Meetings now start at 7:30 a.m. and last a half hour. The size of the sessions has been reduced to a maximum of 25 men for effective control and better individual participation.

NSC safe driver awards were issued, and a cash bonus was offered. The bonus paid a minimum of $30 for driving one year without a chargeable

Elmer Dupuis is superintendent of the safety engineering department, St. Louis Branch, United States Fidelity & Guaranty Co.

accident to a maximum of $100 for five continuous accident-free years. This plan was discontinued three years later, when sizeable pay increases were put into effect and individual operator records had improved considerably. Abandoning the cash plan had no effect on the continued improvement of driving records.

Insurance company and National Safety Council safe driver awards now provide the incentive for safe driving.

When necessary, preventability of accidents is decided by an employee-management committee. The committee tries to decide the question "Could the operator have done something within reason to have prevented this accident?"

Mileage and frequency records were not available prior to 1951 but complete records and frequencies are now kept by departments and divisions. Monthly vehicle and employee accident frequency recaps are available and accurate cost records maintained in order to keep everyone advised of accident trends.

The 1957 vehicle frequency was 4.6 accidents for each 100,000 miles. Mileage for this period was 2,303,730. Every vehicle accident, regardless of how slight, is counted as an accident unless the vehicle was properly parked at the time of the accident. When necessary, accidents are thoroughly investigated at the scene, primarily to determine what the operator should have done to prevent the accident and to pass that information on to other operators in meetings to prevent recurrence. Valuable claim facts are also obtained in the same manner.

Due to the high turnover in the industrial department at the beginning of this program, it was necessary to spend about eight hours indoctrinating each group of new employees. Weekly meetings were held with these employees until turnover was reduced.

The age bracket of these men was such that the draft contributed to the high turnover. At the present time, it is only necessary to give each new employee sufficient special training to take Missouri state driving and written chauffeur's tests. The average age of new trainees is still 18 years, but they have now usually received high school driver training which provides a good basic driving background. Attendance at the regular meetings and on-the-job training completes the route salesman's education.

Training Schedule

Saturday 9 a.m. meetings for all new employees who have reported for work during the week. This applies only to industrial route salesmen. New men are first introduced. Then general information on defensive driving is discussed. A typical meeting covers the following subjects:

- Accident report form: Why? Where? When? How? Witness card, ambulances, doctors, etc. (distribute kit).
- Stopping distances: (use NSC safety instruction cards, posters).
  Define reaction time.
  Define braking distance.
  Define stopping distances.
  Stopping distances at 20 m.p.h. with good conditions and excellent brakes.
  Stopping distances at 20 m.p.h. with good conditions and passable brakes.
  Review detonator and actual tests.
  Ten m.p.h. following distance rule and limitations of this rule.
  Show on blackboard what occurs when a person is driving 20 m.p.h. behind another vehicle and the distance between vehicles is one vehicle length and the vehicle in front makes an emergency stop.
- Review typical accidents using sketches on board.
- Discuss conditions which govern speed. (Use USF&G booklet.)
- Problems relating to intersections, including blind intersections:
  How to leave an alley, laws on backing out of alley, etc.
- Review local speed laws and other violation problems.
- Define preventability accidents and tell how committee decides preventability. Explain driver's record card and what records are kept in this manner.
- Pass out Quiz No. 1 for completion and then review incorrect answers—do not use individual names.
- After meeting, schedule trial trip reports and test runs over prepared

Turn Page

SAFETY DIRECTOR Edsel Hatfield (left) and author Dupuis study accident trend of the past 12 months.

INSTRUCTOR Zerillo measures salesman's reaction time, color recognition, night vision and glare recovery.

areas to test clearances, parking, etc. These tests are usually made after men have been on a route for a few weeks or a month.

Accident report kits are carried by each operator. These kits contain reporting instructions, address cards for witnesses and a detailed reporting folder. Operators are fully trained in completing reports, and the importance of preparing them at the scene of each accident is emphasized. After a report is completed, it is reviewed by the operator's supervisor and the safety director for accident control and claim purposes. New operators are trained in the use of the form so they will be familiar with it in the event of an accident.

Detonator "A" Testing

Detonator "A," a mechanical reaction time and stopping distance measuring device, is used to familiarize each operator with reaction time, reaction distances and stopping distances. The entire fleet—278 drivers—has been given the detonator test twice and complete results discussed in meetings.

Results are tied in with safe following distance rules, intersection problems and other driving situations concerning reaction time. Results of the tests are compared with the published averages and considerable time is spent explaining the difference between reaction time during an actual test and in an emergency.

Simple reaction time is explained in detail and compared with reaction time under normal driving conditions. Perception time is also explained. Trucks are tested at speeds no greater than 20 m.p.h. and passenger vehicles at 30 m.p.h. It is felt that speeds greater than these are unsafe for normal test purposes.

Palletized trucks are always tested empty since a swerving vehicle of this type will throw part of its load. When a large number of drivers are given the detonator test, it is desirable to use the .22 blank cartridge which has been charged with yellow paint powder. The regular .22 blank with capsule is not satisfactory for a large number of tests.

The Saf-T-Rater tests which measure reaction time, depth perception, peripheral vision, acuity, color blindness, night vision and night recovery vision are given all operators. The tests are reviewed and meetings held to discuss results and distribute individual results, with written comments, to each operator. The primary purpose of the tests is to point out physical defects of each operator so that he will understand his deficiencies and how to compensate for them. Again simple reaction time is compared to the reaction time obtained during detonator tests to show reasons for differences.

A film library has been purchased and is kept up-to-date by the addition of current films. The specific 10-minute films are very satisfactory since remedies suggested in them can be applied to company problems.

One example is the backing information given.

In addition to the usual backing instructions covered, the following one taken from the company instruction booklet is emphasized during the discussion, since most of the company vehicles carry two men. "When the driver is accompanied by a helper, extra man, supervisor, etc., the correct place for that person during backing operations is near the left rear corner of the vehicle where he can view the entire backing area and at the same time be seen by the operator. If the driver loses sight of this person, he should stop immediately and wait until the helper is again in a correct position."

Frequent use of this type of meeting resulted in an 80 per cent reduction in backing accidents during the first six months of 1952.

Past accidents are discussed when they appropriately fit the film subject. Short mimeographed quizzes are prepared using film material and other meeting material so that operators may complete the quiz in about five minutes. Results of the quiz are invaluable in determining points for further review in future meetings and also help the operator retain points covered during the meeting.

Safety material, such as appropriate National Safety Council safety instruction cards and special safety posters obtained through the insurance company, is used in meetings and distributed.

During the past few years detailed accident information, involving employee injuries as well as fleet accidents, has been reviewed. This material, covering experience of the past seven years, has been published in booklet form.

The 42-page fleet safety booklet is entitled "Operation Safety." The employee injury safety booklet, "Your Injury Problem," contains 10 pages of detailed instructions. Both booklets were prepared by Edsel Hatfield, safety director, with the assistance of USF&G.

Coca-Cola's accident trend for the period 1951 through 1957 tells a dramatic story. The first active year shows a very rapid reduction in frequency and a continuous marked reduction up to the present time. The current frequency of 4.6 is about 25 per cent lower than the national average.

Although most of the effort during

SALESMAN IS SHOWN his reaction time and stopping distance measurements on Detonator "A." Entire fleet took detonator test twice.

the past seven years has been concentrated on reduction of vehicle accidents, work efforts have also been made to reduce employee injuries.

Since most disabling injuries are suffered by route salesmen, it is interesting to note that the reduction in employee injuries has followed the same trend as vehicle accidents. During the first three years of the program, a rapid reduction in employee injury frequently was noted. It then leveled off and increased gradually during the past three years. However, the rate is presently about half the U.S. Department of Labor national average. At the present time the company is increasing its accident control to reverse the trend.

Certificates and plaque awards have been received from the National Safety Council, USF&G and the Greater Safety Council of St. Louis during the past three years. The St. Clair Distributing warehouse received national recognition in 1954 by winning a first place National Safety Council Award in the Beverage Division Fleet Safety Council contest. In 1955, three divisions received perfect record awards from the National Safety Council. St. Clair Division is going into its seventh consecutive year with no preventable accidents. Fleet awards have been received each year since 1952 from the St. Louis Safety Council for improvement over previous years. For 1957 the entire company received first place in its appropriate fleet division as well as first place in fleets having over 51 vehicles.

Safety Director Hatfield is active in NSC fleet committee work and strongly recommends membership in NSC for all organizations. Membership has been valuable to his company and he states, "Every bottler of Coca-Cola should be interested in accident prevention to the extent of full NSC membership and participation in the fleet contests. He should actively support all local and national safety campaigns and encourage other fleet operators to do likewise."

The Coca-Cola Bottling Co. of St. Louis estimates that it would have had 3,422 more vehicle accidents during the past seven years if the accident control program had not been placed in operation and if the frequency of accidents had remained the same as it was when the program started.

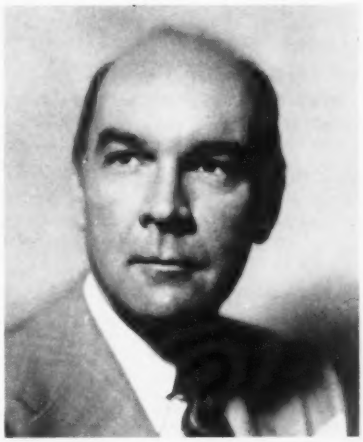
Dr. Kenneth McFarland To Be Luncheon Speaker

Dr. Kenneth McFarland, rated as "America's outstanding salesman and speaker," will be the keynote speaker Oct. 23 at the National Fleet Safety Contest Award luncheon.

The luncheon will be held in conjunction with the 46th National Safety Congress.

Dr. McFarland, educational consultant for General Motors Corp., will address more than 600 persons—award winners, their guests and leaders in the field of motor transportation—at the General Motors-sponsored luncheon.

Winners of the safety award will come from beverage, city bus, ice cream and dairy products, police, taxicab, petroleum refining and government fleets that are members of the transit and commercial vehicle sections of the Council.



Dr. McFarland was named outstanding salesman for 1957 by the National Sales Executives Club and the U. S. No. 1 speaker by a U. S. Chamber of Commerce survey.

PLANS FOR TRAFFIC SECTION CONGRESS SESSIONS UNDERWAY

Plans for the Traffic Section sessions of the 46th Annual Safety Congress —to be held at the Congress Hotel in Chicago October 20 through 24 are nearing completion.

This year's program will emphasize driver licensing, new techniques in traffic safety, and the problem of the youthful driver.

For the first time the Paul G. Hoffman Award will be presented at the traffic sessions. Another innovation is the co-sponsoring— by the Traffic and Transportation Conference and the Women's Activities Conference— of a session entitled: "Women—They Figure." Three outstanding masculine speakers will discuss the woman's role in safety.

There will be a special evening session on the subject of motorized bicycle and scooter operators. This will be a joint session of the Traffic Section and the School and College Section.

The Police Group Session will feature a debate between a teen-age boy and girl on the question: "Should Youthful Traffic Violators Be Treated as Adults?"

The Courts Group Session will consist of a panel discussion of the merits of sending drunk drivers to jail on a first offense.

One general session will be devoted entirely to driver licensing. Another will highlight new developments in traffic safety research.

There will also be a General Session dealing with successful techniques in traffic safety in such areas as adult driver education, control of drinking drivers, pedestrian protection, mobilization of public support, cooperating with religious groups, and driver improvement through the courts.

Eighteen Win NSC Railroad Award

FROM the moment the roar of the steam locomotive was heard in the land, American railroading has shared the life of communities it helped found and develop. Part of that life is safety—in the shop, the home, along the line and on the highway.

Five years ago the National Safety Council instituted its annual Railroad Safety Award in order to recognize the railroads for their safety efforts. Symbol of the award is a golden rail spike emblazoned on a plaque, representing safety service to employees and the general public.

This year there were 18 winners. Practically all of them supported the Council's "Signs of Life" program, a campaign to help motorists recognize and obey traffic signs. The winners also cooperated with local authorities in controlling grade crossing violations, conducted extensive programs in safety education for school children and held family-safety nights and picnics.

The railroad award is made on a non-competitive basis. If the judges decide the railroad is implementing a vigorous on-and-off-the-job safety program in communities it serves, the line gets the award.

Other major factors in making the awards: amount of support given to national, state and local safety groups and campaigns, number of employees engaged in safety work, use of safety materials, production of safety literature and films and use of radio, TV and press for publicity and safety appeals.

Here are the winners for 1957: Atchison, Topeka & Santa Fe Railway System, Baltimore and Ohio Railroad Co., Canadian National Railway, The Canadian Pacific Railway, Chesapeake & Ohio Railway Co., Chicago, Burlington & Quincy Railroad Co., Chicago & Eastern Illinois Railroad Co., Chicago, Milwaukee, St. Paul & Pacific Railroad, Elgin, Joliet & Eastern Railway Co., Denver and Rio Grande Western Railroad Co., Illinois Central Railroad, New York Central System, The Pennsylvania Railroad, Reading Co., St. Louis-San Francisco Railway Co., Southern Pacific Co., The Texas & Pacific Railway Co., Union Pacific Railway Co., Union Pacific Railroad Co.

Four in a Row for the Post Office

The Post Office Department has been honored with a fourth consecutive National Safety Council Citation Award for "outstanding contributions" to the nation's traffic safety in 1957. This is the first time that any organization has won the award four years in a row.

Postmaster General Arthur E. Summerfield (left above) accepted the award from Gen. George C. Stewart, Council executive vice president.

Here are some of the 1957 achievements which helped win the award for the postal service.

In 1957, postal vehicles were driven 884,069,485 miles with an accident rate of only 2.13 for every 100,000 miles driven and a casualty rate of .06.

The department vigorously promoted local safety efforts through its 37,000 field installations in every community in the nation.

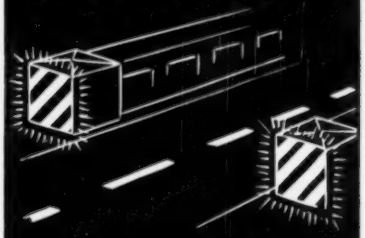
In 1957, 37,500 postal drivers earned individual National Safety Council Safe Driver Awards for one to 27 years of safe driving.

The department was also recognized for the outstanding record of postal employees in practicing safety themselves and encouraging community safety.

Solve Street and Highway Reflectorizing Problems with

FLEX-O-LITE

Type H Safety Spheres



Low first cost—low upkeep—plus fully effective night and day protection is assured with Type H Safety Spheres. Terrific bead brilliance. Long lasting! Apply with ordinary traffic paint at pennies per square foot. Write for details.

FLEX-O-LITE MFG. CORP.
8301 Flex-O-Lite Drive
P.O. Box 3066 (Affton Br.), St. Louis 23, Mo.

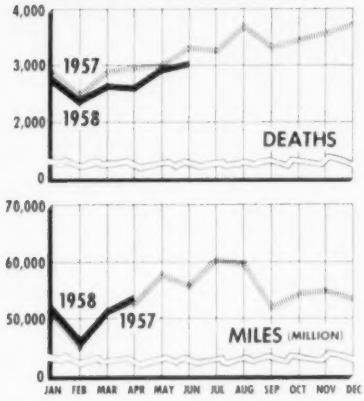
Circle Item No. 5—Reader Service Card

From Page 4

The three leading cities in each population group at the end of six months, ranked according to the number of deaths per 10,000 registered vehicles were:

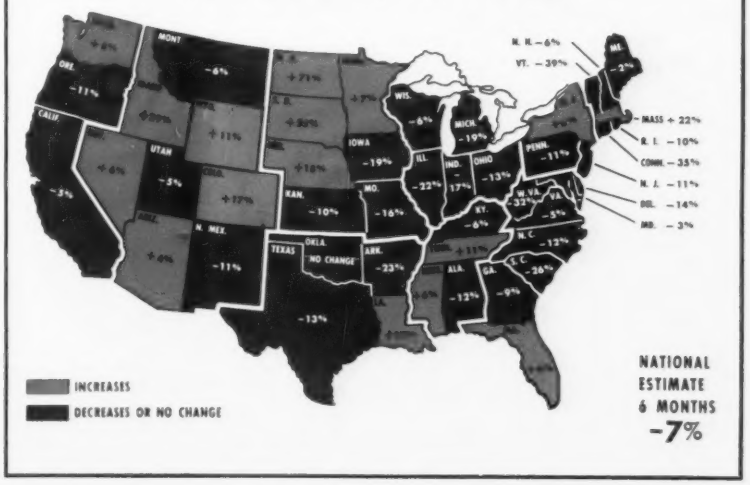
	Reg. Rate	Pop. Rate
Group I (Over 1,000,000)		
Detroit, Mich.	2.4	8.3
Chicago, Ill.	2.8	7.5
Los Angeles, Calif.	3.0	15.4
Group II (750,000 to 1,000,000)		
St. Louis, Mo.	2.0	7.0
San Francisco, Calif.	2.2	8.0
Washington, D. C.	2.3	6.3
Group III (500,000 to 750,000)		
Milwaukee, Wis.	1.8	6.5
Minneapolis, Minn.	2.0	8.1
Dallas, Tex.	2.2	10.3
Group IV (350,000 to 500,000)		
Indianapolis, Ind.	1.4	6.9
Memphis, Tenn.	1.7	4.9
Portland, Ore.	1.8	9.2
Group V (200,000 to 350,000)		
Wichita, Kan.	0.7	4.5
Syracuse, N. Y.	0.9	3.7
Dayton, Ohio	1.1	6.2
Group VI (100,000 to 200,000)		
Kansas City, Kan.	0.3	1.5
Erie, Pa	0.3	1.5
Hartford, Conn.	0.4	1.1
Group VII (50,000 to 100,000)		
Orlando, Fla.	0.0	0.0
Santa Ana, Calif.	0.0	0.0
Macon, Ga	0.0	0.0
Group VIII (25,000 to 50,000)		
Boise, Idaho	0.0	0.0
Yakima, Wash.	0.0	0.0
Birmingham, Mich.	0.0	0.0
Group IX (10,000 to 25,000)		
Kingsport, Tenn.	0.0	0.0
Medford, Ore.	0.0	0.0
Napa, Calif.	0.0	0.0

MONTHLY MOTOR VEHICLE DEATHS AND TRAFFIC TRENDS 1957-1958



● **STATE and city death records listed on these pages are reported to the Council by state and city agencies participating in the Council's accident reporting project. Reporting deadline for cities is the 23rd of the following month —for states, the 25th.**

CHANGES IN MOTOR-VEHICLE DEATHS
FIRST 6 MONTHS, 1957 TO 1958



MOTOR VEHICLE DEATHS AND DEATH RATES
1956, 1957 and 1958

Month	1956	1957	1958	1956-58 Change	1957-58 Change
January	2,954	2,880	2,760	— 7%	— 4%
February	2,652	2,480	2,330	—12%	— 6%
March	2,940	2,890	2,630	—11%	— 9%
April	2,970	2,950	2,600	—12%	—12%
May	3,094	3,000	2,910	— 6%	— 3%
June	3,338	3,310	3,010	—10%	— 9%
Six Months	17,948	17,510	16,240	—10%	— 7%
July	3,555	3,240			
August	3,535	3,690			
September	3,653	3,330			
October	3,476	3,450			
November	3,603	3,570			
December	3,858	3,710			
Total	39,628	38,500			

All 1956 figures are from the National Office of Vital Statistics.

All other figures are National Safety Council estimates. The 1958 national estimate is arrived at by assuming that the percentage change from 1957 to 1958 in the states reporting for both years reflects the 1957-1958 change in the entire country. First reports are preliminary, so revisions are made from time to time as later reports are received for the various months. Thus, figures above for 1958 may differ slightly from figures for the same months which will be published in future issues of TRAFFIC SAFETY.

TRAFFIC DEATHS—CITY RECORDS

The table covers only motor-vehicle deaths resulting from traffic accidents that occurred in the city. Nontraffic motor-vehicle deaths (where the accident occurred on home or work premises) are not included; nor are deaths in the city from accidents occurring outside.

Rankings are based on the 1958 registration death rate which is the number of deaths per 10,000 registered motor vehicles on an annual basis. Vehicle registration figures are for the year 1957 and were supplied by R. L. Polk & Company.

Cities are ranked by death rates—from low to high. When two or more cities have exactly the same rate, ranking is by total vehicle registrations—from large to small.

Cities shown in heavy type have improved in 1958 compared with 1957.

The population death rate is the number of deaths per 100,000 population on an annual basis. Populations are as of April, 1950, or later censuses taken by the U. S. Bureau of the Census.

	Six Months 1958	1957	1956	1958 Reg. Rate	1958 Pop. Rate
ALL REPORTING CITIES				2.1	8.3
(Group I (1,000,000 and over)					
1. Detroit, Mich.	79	89	109	2.4	8.3
2. Chicago, Ill.	141	162	174	2.8	7.5
3. Los Angeles, Calif.	173	189	189	3.0	15.4
4. Philadelphia, Pa.	76	80	97	3.0	7.3
All cities in this group				3.3	8.9
5. Baltimore, Md.	63	50	55	4.1	12.2
6. New York, N. Y.	308	281	284	4.5	7.9
Group II (750,000 to 1,000,000)					
1. St. Louis, Mo.	30	38	56	2.0	7.0
2. San Francisco, Calif.	31	43	38	2.2	8.0
3. Washington, D. C.	26	31	31	2.3	6.3
All cities in this group				2.4	7.7
4. Cleveland, Ohio	45	60	56	2.9	9.3
(Group III (500,000 to 750,000)					
1. Milwaukee, Wis.	23	22	41	1.8	6.5
2. Minneapolis, Minn.	21	22	11	2.0	8.1
3. Dallas, Texas	30	34	9	2.2	10.3
4. Seattle, Wash.	32	19	26	2.4	11.2
5. Houston, Texas	45	48	33	2.4	12.7
6. Boston, Mass.	23	25	31	2.6	6.3
All cities in this group				2.8	10.2
7. Pittsburgh, Pa.	31	21	29	3.1	9.1
8. Buffalo, N. Y.	32	28	26	3.3	10.6
9. New Orleans, La.	36	47	40	4.1	12.0
10. San Diego, Calif.	44	28	35	5.1	17.6
Group IV (350,000 to 500,000)					
1. Indianapolis, Ind.	16	19	17	1.4	6.9
2. Memphis, Tenn.	12	17	18	1.7	4.9
3. Portland, Ore.	19	20	24	1.8	9.2
4. Kansas City, Mo.	16	19	18	2.0	7.0
5. Denver, Colo.	22	15	16	2.1	9.3
6. San Antonio, Texas	22	30	22	2.2	9.7
7. Oakland, Calif.	18	26	25	2.4	9.4
All cities in this group				2.4	9.7
8. Louisville, Ky.	22	19	26	2.7	11.2
9. Columbus, Ohio	25	24	26	2.8	11.6
10. Birmingham, Ala.	21	19	21	3.5	11.7
11. Atlanta, Ga.	41	40	30	4.6	16.7
Group V (200,000 to 350,000)					
1. Wichita, Kans.	5	9	6	0.7	4.5
2. Syracuse, N. Y.	4	3	7	0.9	3.7
3. Dayton, Ohio	8	12	12	1.1	6.2
4. Toledo, Ohio	9	16	10	1.2	5.9
5. Tulsa, Okla.	9	7	3	1.4	8.1
6. Flint, Mich.	8	7	6	1.5	7.8
7. Worcester, Mass.	5	7	7	1.7	4.9
8. Providence, R. I.	8	9	6	1.8	6.4
9. Oklahoma City, Okla.	14	9	9	1.9	9.8
10. Long Beach, Calif.	13	10	14	1.9	7.7
11. Fort Worth, Texas	16	17	28	1.9	9.7
12. Omaha, Neb.	11	8	11	2.0	7.9
13. Tampa, Fla.	12	12	20	2.0	8.9
All cities in this group				2.1	9.7
14. Miami, Fla.	25	19	13	2.2	19.3
15. Richmond, Va.	13	10	19	2.3	10.9
16. St. Paul, Minn.	19	14	10	2.7	12.1
17. Norfolk, Va.	12	6	6	2.7	8.0
18. Akron, Ohio	26	28	15	4.1	17.0
19. Jacksonville, Fla.	19	9	10	4.6	15.2
20. El Paso, Texas	20	8	23	5.6	16.0
Group VI (100,000 to 200,000)					
1. Kansas City, Kan.	1	6	3	0.3	1.5
2. Erie, Pa.	1	9	4	0.3	1.5
3. Hartford, Conn.	1	3	3	0.4	1.1
4. Yonkers, N. Y.	1	4	4	0.4	1.1
5. Lincoln, Neb.	1	2	8	0.4	1.7
6. Austin, Texas	2	6	7	0.6	2.4
7. Rockford, Ill.	2	9	1	0.6	3.7
8. South Bend, Ind.	2	2	5	0.6	3.0
9. Evansville, Ind.	2	9	5	0.6	2.4
10. Peoria, Ill.	2	6	2	0.7	3.4
11. Montgomery, Ala.	2	1	5	0.7	3.4
12. Saginaw, Mich.	2	9	8	0.8	3.9
13. Madison, Wis.	2	2	1	0.8	3.6
14. Savannah, Ga.	2	5	6	0.8	3.1
15. Amarillo, Texas	2	3	9	0.8	4.0
16. Fresno, Calif.	4	7	5	0.8	6.5
17. Arlington, Va.	3	4	7	1.0	3.8
18. Bridgeport, Conn.	3	7	6	1.0	3.4
19. Utica, N. Y.	2	2	0	1.2	3.8
20. Lubbock, Texas	3	1	2	1.2	5.7
21. Fort Wayne, Ind.	5	7	6	1.3	6.9
22. Allentown, Pa.	3	3	2	1.3	5.4
23. Waco, Texas	3	4	7	1.3	5.9
24. Knoxville, Tenn.	4	4	5	1.4	6.4
25. Shreveport, La.	5	5	9	1.4	6.4
26. Grand Rapids, Mich.	8	10	17	1.4	8.2
27. Spokane, Wash.	6	8	12	1.4	6.4
28. Sacramento, Calif.	7	6	13	1.4	8.9
29. Glendale, Calif.	4	6	8	1.5	7.0
30. Trenton, N. J.	4	2	6	1.5	6.3
31. New Haven, Conn.	4	7	5	1.5	4.8
32. Little Rock, Ark.	4	4	5	1.6	7.5
33. Canton, Ohio	5	9	9	1.6	7.8
34. Wilmington, Del.	5	2	3	1.6	9.1
35. Des Moines, Iowa	7	8	3	1.6	7.7
36. Salt Lake City, Utah	8	3	11	1.6	8.3
37. Charlotte, N. C.	7	7	13	1.7	9.0
38. Berkeley, Calif.	4	0	4	1.7	6.8
All cities in this group				1.7	7.7
39. Waterbury, Conn.	3	1	3	1.8	5.3
40. Youngstown, Ohio	8	7	9	2.0	9.0
41. Tacoma, Wash.	8	9	8	2.1	10.2
42. Pasadena, Calif.	7	11	11	2.2	12.2
43. San Jose, Calif.	10	6	13	2.2	15.7
44. Gary, Ind.	8	10	11	2.2	9.5
45. Nashville, Tenn.	12	6	17	2.4	13.8
46. Albuquerque, N. M.	9	7	3	2.4	10.6
47. Phoenix, Ariz.	20	7	12	2.5	25.0
48. Baton Rouge, La.	9	5	6	2.6	12.6
49. Springfield, Mass.	8	2	9	2.6	9.6
50. Niagara Falls, N. Y.	5	3	8	2.7	9.9
51. Corpus Christi, Texas	10	7	8	2.9	13.8
52. Reading, Pa.	7	6	0	3.2	12.3
53. Mobile, Ala.	12	10	11	3.8	13.8
54. Elizabeth, N. J.	7	10	5	3.8	11.9
55. Chattanooga, Tenn.	11	10	14	3.8	16.8
56. Hammond, Ind.	8	12	6	4.3	14.8
57. Duluth, Minn.	11	6	5	5.1	20.8
Group VII (50,000 to 100,000)					
1. Orlando, Fla.	0	3	5	0.0	0.0
2. Santa Ana, Calif.	0	1	5	0.0	0.0
3. Macon, Ga.	0	2	0	0.0	0.0
4. Jackson, Mich.	0	1	3	0.0	0.0
5. Battle Creek, Mich.	0	2	0	0.0	0.0
6. Racine, Wis.	0	0	2	0.0	0.0
7. Anderson, Ind.	0	2	2	0.0	0.0
8. Evanston, Ill.	0	3	0	0.0	0.0
9. Bethlehem, Pa.	0	3	3	0.0	0.0
10. Bay City, Mich.	0	2	1	0.0	0.0
11. Portland, Me.	0	5	5	0.0	0.0
12. San Angelo, Texas	0	3	2	0.0	0.0
13. Parma, Ohio	0	2	1	0.0	0.0
14. Elmira, N. Y.	0	0	1	0.0	0.0
15. Medford, Mass.	0	3	5	0.0	0.0
16. Dubuque, Iowa	0	1	2	0.0	0.0
17. Bloomfield, N. J.	0	1	1	0.0	0.0
18. W. Hartford, Conn.	0	1	1	0.0	0.0
19. Woonsocket, R. I.	0	2	0	0.0	0.0
20. Columbia, S. C.	1	7	4	0.4	2.1
21. Charleston, W. Va.	1	1	0	0.4	2.7
22. Royal Oak, Mich.	1	3	3	0.5	2.8
23. Greenville, S. C.	1	3	4	0.5	3.1
24. Columbus, Ga.	1	1	2	0.5	2.2
25. Newton, Mass.	1	6	1	0.5	2.3
26. Lancaster, Pa.	1	4	4	0.5	3.0
27. Davenport, Iowa	1	2	1	0.6	2.5
28. Abilene, Texas	1	0	2	0.6	3.3
29. Warren, Ohio	1	1	2	0.6	3.5
30. St. Joseph, Mo.	1	2	3	0.7	2.5
31. Aurora, Ill.	1	2	0	0.7	3.5
32. Manchester, N. H.	1	2	2	0.7	2.3
33. Mt. Vernon, N. Y.	1	0	1	0.7	2.7
34. Tucson, Ariz.	3	10	8	0.7	8.6
35. Sioux Falls, S. D.	1	0	1	0.7	3.4
36. Kenosha, Wis.	1	1	0	0.7	3.1
37. Pawtucket, R. I.	1	1	0	0.7	2.3
38. Lakewood, Ohio	1	2	3	0.8	2.8
39. Pensacola, Fla.	2	1	4	0.8	7.8
40. New Rochelle, N. Y.	1	1	3	0.8	2.8
41. Burbank, Calif.	2	2	2	0.8	4.4
42. Alexandria, Va.	2	4	1	0.9	4.7
43. Oak Park, Ill.	1	1	4	0.9	3.3
44. Colorado Spgs., Colo.	2	3	2	0.9	6.4
45. Pueblo, Colo.	2	2	1	1.0	4.8
46. Alameda, Calif.	1	1	1	1.0	2.8
47. Springfield, Ohio	2	2	2	1.0	4.7
48. Lynchburg, Va.	1	3	2	1.0	3.8
49. Lwr. Merion Twp., Pa.	1	1	2	1.1	3.5
50. Binghamton, N. Y.	2	1	1	1.1	4.9
51. Passaic, N. J.	1	3	1	1.1	3.5
52. Terre Haute, Ind.	2	0	6	1.1	6.1
53. Muncie, Ind.	2	1	4	1.1	6.1
54. Johnstown, Pa.	2	3	1	1.1	6.3
55. Meriden, Conn.	1	1	4	1.2	3.4
56. Fort Lauderdale, Fla.	4	3	4	1.2	12.7
57. Raleigh, N. C.	3	2	3	1.2	8.5
58. Green Bay, Wis.	2	3	6	1.3	7.3
59. Schenectady, N. Y.	3	3	1	1.3	6.5
60. Augusta, Ga.	2	1	3	1.3	5.4
61. Portsmouth, Va.	2	3	3	1.4	4.4
62. Norwalk, Conn.	1	5	4	1.4	3.2
63. Roanoke, Va.	3	7	2	1.4	6.3
64. Lynn, Mass.	2	0	2	1.4	4.0
65. Asheville, N. C.	2	1	0	1.4	7.5
66. Lexington, Ky.	3	1	2	1.5	8.9
67. San Leandro, Calif.	2	2	1	1.5	6.5
68. Ann Arbor, Mich.	2	0	2	1.5	7.2
69. East Orange, N. J.	2	4	5	1.5	4.7
70. Springfield, Mo.	3	6	1	1.5	7.5
71. Topeka, Kans.	4	3	3	1.5	9.7
All cities in this group				1.5	6.9
72. Kalamazoo, Mich.	4	4	7	1.6	13.3
73. Joliet, Ill.	3	4	2	1.6	9.9
74. Cedar Rapids, Iowa	3	4	3	1.6	7.6
75. Stockton, Calif.	5	8	3	1.6	13.1
76. W. Palm Beach, Fla.	3	3	7	1.6	11.8
77. Covington, Ky.	2	2	2	1.6	6.2
78. Springfield, Ill.	4	1	2	1.6	9.7
79. Hamilton, Ohio	3	3	3	1.7	8.5
80. Beaumont, Texas	4	5	2	1.7	8.5
81. Sioux City, Iowa	3	5	9	1.9	6.8
82. Council Bluffs, Iowa	2	1	4	1.9	7.5
83. Winston-Salem, N. C.	5	4	3	1.9	11.0
84. Reno, Nev.	3	1	1	1.9	11.5
85. Stamford, Conn.	3	3	2	2.0	6.8
86. Riverside, Calif.	4	5	8	2.0	10.6
87. Charleston, S. C.	2	2	4	2.0	5.7
88. West Allis, Wis.	2	3	2	2.0	6.4
89. San Mateo, Calif.	3	1	4	2.1	9.1
90. Greensboro, N. C.	5	5	4	2.1	12.3
91. Tuscaloosa, Ala.	2	0	4	2.1	7.0
92. Lansing, Mich.	6	5	3	2.1	12.2
93. Pomona, Calif.	3	3	1	2.1	10.2
94. Richmond, Calif.	3	2	10	2.2	6.0
95. Hayward, Calif.	4	1	4	2.2	14.6
96. Wichita Falls, Texas	4	3	3	2.2	8.8
97. Durham, N. C.	4	5	2	2.4	11.2
98. Waltham, Mass.	2	1	3	2.4	8.0
99. Santa Barbara, Calif.	4	1	1	2.4	14.4
100. Ogden, Utah	4	3	2	2.4	12.3
101. Lake Charles, La.	4	3	2	2.5	14.3
102. Gadsden, Ala.	2	3	3	2.6	6.2
103. Berwyn, Ill.	3	1	1	2.7	11.4
104. Decatur, Ill.	6	6	3	2.9	16.0
105. Compton, Calif.	5	5	3	2.9	15.7
106. Wilkes-Barre, Pa.	4	2	0	2.9	10.4
107. Lorrain, Ohio	4	0	3	2.9	12.8
108. Euclid, Ohio	3	2	5	3.0	10.5
109. Pontiac, Mich.	8	1	3	3.0	19.8
110. New Britain, Conn.	4	1	1	3.0	9.1
111. San Bernardino, Calif.	8	9	6	3.1	19.3
112. Pittsfield, Mass.	3	1	2	3.1	10.8

	Six Months 1958	1957	1956	1958 Reg. Rate	1958 Pop. Rate
113. Atlantic City, N. J.	2	1	7	3.2	6.5
114. Waterloo, Iowa	5	4	5	3.3	14.3
115. Santa Monica, Calif.	5	6	4	3.3	13.1
116. East Chicago, Ind.	3	2	5	3.5	10.5
117. Wheeling, W. Va.	5	5	4	4.3	17.0
118. Brockton, Mass.	5	4	0	4.5	15.9
119. Fort Smith, Ark.	5	9	2	4.5	16.7
120. Brookline, Mass.	4	2	2	4.5	14.1
121. Hampton, Va.	13	3	7	10.7	34.1
122. Warren, Mich.	5	3	1	19.5	15.7

Group VIII (25,000 to 50,000)

1. Boise, Idaho	0	1	2	0.0	0.0
2. Yakima, Wash.	0	1	2	0.0	0.0
3. Birmingham, Mich.	0	1	0	0.0	0.0
4. Palo Alto, Calif.	0	2	2	0.0	0.0
5. Tyler, Texas	0	1	1	0.0	0.0
6. Kettering, Ohio	0	3	2	0.0	0.0
7. Lafayette, Ind.	0	1	0	0.0	0.0
8. Everett, Wash.	0	2	1	0.0	0.0
9. Cheyenne, Wyo.	0	2	0	0.0	0.0
10. Casper, Wyo.	0	0	2	0.0	0.0
11. Easton, Pa.	0	1	2	0.0	0.0
12. Elyria, Ohio	0	0	0	0.0	0.0
13. East Detroit, Mich.	0	2	3	0.0	0.0
14. Appleton, Wis.	0	1	1	0.0	0.0
15. Mt. Clemens, Mich.	0	1	0	0.0	0.0
16. Fullerton, Calif.	0	3	6	0.0	0.0
17. Cuyahoga Falls, Ohio	0	0	4	0.0	0.0
18. Enid, Okla.	0	0	1	0.0	0.0
19. Sheboygan, Wis.	0	1	2	0.0	0.0
20. Bloomington, Ind.	0	0	0	0.0	0.0
21. Chicopee, Mass.	0	1	2	0.0	0.0
22. Portsmouth, Ohio	0	1	6	0.0	0.0
23. Arlington, Mass.	0	0	0	0.0	0.0
24. Mishawaka, Ind.	0	4	1	0.0	0.0
25. Sandusky, Ohio	0	4	1	0.0	0.0
26. Galesburg, Ill.	0	0	0	0.0	0.0
27. Bloomington, Ill.	0	4	0	0.0	0.0
28. Rome, N. Y.	0	0	0	0.0	0.0
29. West Haven, Conn.	0	0	2	0.0	0.0
30. Monrovia, Calif.	0	2	2	0.0	0.0
31. Norwich, Conn.	0	1	4	0.0	0.0
32. Manhattan Bch., Calif.	0	1	3	0.0	0.0
33. Chicago Heights, Ill.	0	0	1	0.0	0.0
34. Fitchburg, Mass.	0	0	0	0.0	0.0
35. New Kensington, Pa.	0	0	1	0.0	0.0
36. St. Cloud, Minn.	0	0	1	0.0	0.0
37. St. Louis Pk., Minn.	0	0	1	0.0	0.0
38. Torrington, Conn.	0	1	0	0.0	0.0
39. Provo, Utah	0	2	3	0.0	0.0
40. Bangor, Me.	0	1	1	0.0	0.0
41. Milford, Conn.	0	0	0	0.0	0.0
42. Burlington, Vt.	0	0	0	0.0	0.0
43. Minot, N. D.	0	1	1	0.0	0.0
44. Bristol, Conn.	0	1	1	0.0	0.0
45. Webster Groves, Mo.	0	2	0	0.0	0.0
46. Grand Forks, N. D.	0	0	1	0.0	0.0
47. Denton, Texas	0	0	3	0.0	0.0
48. Urbana, Ill.	0	0	1	0.0	0.0
49. Selma, Ala.	0	0	0	0.0	0.0
50. Winona, Minn.	0	0	5	0.0	0.0
51. Belmont, Mass.	0	1	1	0.0	0.0
52. Forest Park, Ill.	0	0	0	0.0	0.0
53. Las Vegas, Nev.	1	0	0	0.5	4.5
54. Odessa, Texas	1	2	1	0.6	4.5
55. Billings, Mont.	1	0	0	0.7	5.2
56. Wyandotte, Mich.	1	4	1	0.7	4.3
57. White Plains, N. Y.	1	1	3	0.7	4.0
58. Vancouver, Wash.	1	7	2	0.7	4.8
59. High Point, N. C.	1	1	1	0.8	4.5
60. Elkhart, Ind.	1	2	0	0.8	5.2
61. Spartanburg, S. C.	1	0	0	0.8	4.8
62. Ontario, Calif.	1	4	0	0.9	4.8
63. Kokomo, Ind.	1	0	1	0.9	4.5
64. Hutchinson, Kans.	1	0	2	0.9	5.5
65. Beverly Hills, Calif.	1	0	3	0.9	6.6
66. Vallejo, Calif.	1	1	0	1.0	4.5
67. Owensboro, Ky.	1	0	2	1.0	5.1
68. Zanesville, Ohio	1	0	0	1.0	4.9
69. Rock Island, Ill.	1	0	5	1.0	4.0
70. La Crosse, Wis.	1	1	2	1.0	4.2
71. Hagerstown, Md.	1	1	1	1.0	5.2
72. Wauwatosa, Wis.	1	2	2	1.0	4.3
73. Salina, Kans.	1	1	1	1.0	6.2
74. University City, Mo.	1	3	0	1.1	4.2
75. Richmond, Ind.	1	0	0	1.1	5.1
76. Aurora, Colo.	1	0	0	1.1	8.0
77. Newburgh, N. Y.	1	1	1	1.1	5.9
78. Oshkosh, Wis.	1	1	1	1.1	4.6
79. Muskegon, Mich.	2	4	2	1.1	8.3
80. Marion, Ohio	1	2	0	1.1	5.6
81. Burlington, N. C.	1	2	0	1.1	8.0
82. Lawton, Okla.	1	3	5	1.1	5.1
83. Hamtramck, Mich.	1	2	1	1.1	5.4
84. Fargo, N. D.	1	0	0	1.1	4.9
85. East Cleveland, Ohio	1	1	1	1.2	5.0
86. Beloit, Wis.	1	4	0	1.2	6.3
87. Eau Claire, Wis.	1	0	0	1.2	5.5
88. Elmhurst, Ill.	1	0	0	1.2	5.8
89. Ferndale, Mich.	1	1	0	1.2	6.4
90. Wausau, Wis.	1	0	1	1.2	6.5
91. Roseville, Mich.	1	5	1	1.2	5.7
92. Granite City, Ill.	1	1	3	1.3	5.6
93. Maywood, Ill.	1	1	2	1.3	6.9
94. Greenwich, Conn.	1	6	3	1.3	4.2
95. Michigan City, Ind.	1	4	0	1.3	6.3
96. Danbury, Conn.	1	3	0	1.3	5.3
97. Steubenville, Ohio	1	2	1	1.3	5.5
98. Mansfield, Ohio	2	2	7	1.5	9.2
99. Manchester, Conn.	1	7	6	1.3	4.5
100. Jackson, Tenn.	1	0	0	1.5	5.9
101. Westfield, N. J.	1	1	1	1.4	7.7
102. Redwood City, Calif.	2	3	7	1.4	10.3
103. Mason City, Iowa	1	0	0	1.5	6.8
104. Lockport, N. Y.	1	2	1	1.5	7.7
105. Park Ridge, Ill.	1	1	1	1.5	7.2
106. Petersburg, Va.	1	0	2	1.5	5.5
107. Allen Park, Mich.	1	0	1	1.5	6.3
108. National City, Calif.	1	0	0	1.5	6.3
All cities in this group				1.5	7.2
109. St. Clair Shores, Mich.	2	0	4	1.6	8.5
110. Florence, S. C.	1	3	0	1.6	7.0
111. Rahway, N. J.	1	1	1	1.6	7.4
112. Redlands, Calif.	1	1	2	1.6	7.8
113. Freeport, Ill.	1	1	2	1.6	7.8
114. Richfield, Minn.	1	0	0	1.6	5.7
115. Montclair, N. J.	1	1	2	7.6	4.5
116. Poughkeepsie, N. Y.	2	2	0	1.6	9.8
117. Waukegan, Ill.	2	0	2	1.7	8.3
118. Sumter, S. C.	1	0	0	1.7	7.9
119. Superior, Wis.	1	4	2	1.7	5.7
120. Temple, Texas	1	3	2	1.8	6.6
121. Richland, Wash.	1	0	1	1.8	7.6
122. Wilmington, N. C.	2	3	2	1.9	8.8
123. Concord, N. H.	1	0	1	1.9	6.7
124. Middletown, Conn.	1	1	1	1.9	5.5
125. Plainfield, N. J.	2	1	1	1.9	8.5
126. Port Huron, Mich.	2	1	0	1.9	11.0
127. Quincy, Ill.	2	4	2	2.0	9.4
128. Pasadena, Texas	2	0	0	2.0	8.4
129. Ventura, Calif.	2	0	2	2.1	15.4
130. Rome, Ga.	2	0	2	2.1	12.4
131. Mt. Lebanon, Pa.	1	0	0	2.1	5.8
132. Modesto, Calif.	4	1	2	2.1	23.7
133. Bellingham, Wash.	2	1	4	2.2	10.9
134. Livonia, Mich.	2	5	2	2.2	10.3
135. Rapid City, S. D.	2	2	2	2.2	10.0
136. Champaign, Ill.	2	1	2	2.2	8.9
137. Rochester, Minn.	2	2	0	2.3	12.8
138. Midland, Texas	3	2	1	2.3	16.4
139. Lincoln Park, Mich.	2	3	4	2.3	9.0
140. Oxnard, Calif.	2	1	4	2.3	11.7
141. Annapolis, Md.	1	0	0	2.3	8.0
142. Gainesville, Fla.	2	0	1	2.4	12.8
143. Tallahassee, Fla.	3	0	0	2.5	15.7
144. Stratford, Conn.	2	4	0	2.5	9.5
145. Janesville, Wis.	2	1	0	2.6	12.5
146. Hamden, Conn.	2	1	0	2.6	11.3
147. Great Falls, Mont.	3	0	1	2.7	12.9
148. Newport News, Va.	2	4	0	2.7	8.2
149. Elgin, Ill.	3	2	2	2.7	12.6
150. Findlay, Ohio	2	1	2	2.7	14.5
151. Kingston, N. Y.	2	0	0	2.7	13.1
152. Burlington, Iowa	2	3	2	2.8	13.1
153. Fair Lawn, N. J.	2	0	0	2.8	14.5
154. Fond du Lac, Wis.	2	0	0	2.8	12.0
155. Walla Walla, Wash.	2	0	1	2.9	15.7
156. Manitowoc, Wis.	2	2	0	2.9	13.3
157. Middletown, Ohio	3	4	2	2.9	17.4
158. Newark, Ohio	3	2	0	2.9	15.5
159. Rock Hill, S. C.	2	0	1	3.0	12.0
160. Hazel Park, Mich.	2	0	1	3.0	15.1
161. Hackensack, N. J.	2	0	2	3.1	12.5
162. Highland Pk., Mich.	3	2	4	3.1	12.9
163. Coral Gables, Fla.	3	2	4	3.3	20.5
164. Clearwater, Fla.	4	1	3	3.4	27.5
165. Arcadia, Calif.	4	2	6	3.5	21.4
166. Daytona Beach, Fla.	3	2	2	3.5	16.6
167. Oak Ridge, Tenn.	2	1	1	3.8	14.0
168. Vineland, N. J.	3	0	6	3.9	18.2
169. Moline, Ill.	4	3	3	4.2	21.1
170. Mountain View, Calif.	3	5	1	4.2	23.1
171. West Orange, N. J.	3	1	1	4.2	17.5
172. Baldwin Park, Calif.	3	0	0	4.3	18.6
173. Warwick, R. I.	4	2	3	4.4	18.6
174. West Covina, Calif.	3	4	2	4.5	13.3
175. Fairfield, Conn.	3	1	1	4.7	19.7
176. Teaneck, N. J.	3	1	0	4.8	15.7
177. East Hartford, Conn.	4	4	2	4.8	20.7
178. Shaker Heights, Ohio	3	0	0	4.9	17.3
179. New London, Conn.	3	0	2	5.0	17.1
180. Linden, N. J.	4	2	2	5.3	21.9
181. Danville, Va.	5	5	1	5.6	20.7
182. Revere, Mass.	3	4	2	5.8	15.2
183. Barberton, Ohio	5	1	0	6.2	28.7
184. Pocatello, Idaho	6	3	1	6.9	44.3

Group IX (10,000 to 25,000)

1. Kingsport, Tenn.	0	0	0	0.0	0.0
2. Medford, Ore.	0	1	0	0.0	0.0
3. Napa, Calif.	0	5	2	0.0	0.0
4. Victoria, Texas	0	2	0	0.0	0.0
5. Butler, Pa.	0	2	0	0.0	0.0
6. So. Euclid, Ohio	0	1	1	0.0	0.0
7. Klamath Falls, Ore.	0	2	0	0.0	0.0
8. Fort Myers, Fla.	0	0	1	0.0	0.0
9. Greeley, Colo.	0	2	1	0.0	0.0
10. Lake Worth, Fla.	0	4	0	0.0	0.0
11. Monroe, Mich.	0	2	0	0.0	0.0
12. La Mesa, Calif.	0	0	2	0.0	0.0
13. Greensburg, Pa.	0	0	1	0.0	0.0
14. Waukesha, Wis.	0	0	3	0.0	0.0
15. Yuma, Ariz.	0	2	0	0.0	0.0
16. Shorewood, Wis.	0	0	0	0.0	0.0
17. Ponca City, Okla.	0	0	1	0.0	0.0
18. Niles, Mich.	0	3	1	0.0	0.0
19. Pampa, Texas	0	1	1	0.0	0.0
20. Bell, Calif.	0	0	1	0.0	0.0
21. Morristown, N. J.	0	1	0	0.0	0.0
22. Sherman, Texas	0	2	0	0.0	0.0
23. Fremont, Ohio	0	0	2	0.0	0.0
24. Kenmore, N. Y.	0	0	0	0.0	0.0
25. La Grange, Ill.	0	0	0	0.0	0.0
26. Carlsbad, N. M.	0	2	2	0.0	0.0
27. Floral Park, N. Y.	0	0	0	0.0	0.0
28. Plainview, Texas	0	0	0	0.0	0.0
29. Helena, Mont.	0	0	0	0.0	0.0
30. Meadville, Pa.	0	0	0	0.0	0.0
31. Manhattan, Kans.	0	2	1	0.0	0.0
32. Tiffin, Ohio	0	0	0	0.0	0.0
33. Frederick, Md.	0	0	0	0.0	0.0
34. Owosso, Mich.	0	0	0	0.0	0.0
35. Goshen, Ind.	0	0	1	0.0	0.0
36. Edina, Minn.	0	1	0	0.0	0.0
37. Jeffersonville, Ind.	0	0	0	0.0	0.0
38. Sedalia, Mo.	0	0	0	0.0	0.0
39. Hibbing, Minn.	0	0	0	0.0	0.0
40. Peru, Ind.	0	0	1	0.0	0.0
41. East Haven, Conn.	0	1	0	0.0	0.0
42. Hanford, Calif.	0	0	0	0.0	0.0
43. North Platte, Neb.	0	0	0	0.0	0.0
44. Bristol, Pa.	0	0	0	0.0	0.0
45. Corvallis, Ore.	0	0	3	0.0	0.0
46. Valparaiso, Ind.	0	0	0	0.0	0.0
47. Caldwell, Idaho	0	0	0	0.0	0.0
48. Griffin, Ga.	0	0	0	0.0	0.0
49. Pittsburg, Kans.	0	0	0	0.0	0.0
50. Muscatine, Iowa	0	1	3	0.0	0.0
51. Frankfort, Ind.	0	0	0	0.0	0.0
52. Maple Heights, Ohio	0	1	3	0.0	0.0
53. Highland Park, Ill.	0	0	1	0.0	0.0
54. Reidsville, N. C.	0	1	0	0.0	0.0
55. Streator, Ill.	0	0	0	0.0	0.0
56. Woodland, Calif.	0	1	0	0.0	0.0
57. Wisconsin Rpds., Wis.	0	0	0	0.0	0.0
58. Martinsburg, W. Va.	0	3	0	0.0	0.0
59. Cranford, N. J.	0	1	0	0.0	0.0
60. Albert Lea, Minn.	0	3	0	0.0	0.0
61. Texarkana, Ark.	0	1	0	0.0	0.0
62. Cape Girardeau, Mo.	0	0	1	0.0	0.0
63. Emporia, Kans.	0	0	0	0.0	0.0
64. Johnson City, N. Y.	0	0	0	0.0	0.0
65. Connersville, Ind.	0	0	0	0.0	0.0
66. Hillside, N. J.	0	0	0	0.0	0.0
67. Sterling, Ill.	0	0	0	0.0	0.0
68. Port Angeles, Wash.	0	1	0	0.0	0.0
69. Berkeley, Mich.	0	3	0	0.0	0.0
70. Alpena, Mich.	0	1	1	0.0	0.0
71. Madison Hts., Mich.	0	0	0	0.0	0.0
72. St. Augustine, Fla.	0	2	0	0.0	0.0
73. Pittsburg, Calif.	0	0	1	0.0	0.0
74. Oswego, N. Y.	0	2	0	0.0	0.0
75. Newport Beach, Calif.	0	1	1	0.0	0.0
76. Wallingford, Conn.	0	0	3	0.0	0.0
77. El Dorado, Kans.	0	2	0	0.0	0.0
78. Greenwood, Miss.	0	1	0	0.0	0.0
79. Arkansas City, Kans.	0	1	0	0.0	0.0
80. Suffolk, Va.	0	0	0	0.0	0.0
81. Cedar Falls, Iowa	0	1	1	0.0	0.0
82. Brainerd, Minn.	0	0	0	0.0	0.0
83. Niles, Ohio	0	1	2	0.0	0.0
84. North Miami, Fla.	0	1	1	0.0	0.0
85. Elmwood Park, Ill.	0	0	1	0.0	0.0
86. McAlester, Okla.	0	0	0	0.0	0.0
87. Stevens Point, Wis.	0	0	2	0.0	0.0
88. Muskegon Hts., Mich.	0	2	1	0.0	0.0
89. Brookfield, Ill.	0	1	0	0.0	0.0
90. Pasco, Wash.	0	1	0	0.0	0.0
91. Corona, Calif.	0	0	0	0.0	0.0
92. Owatonna, Minn.	0	0	0	0.0	0.0
93. Marquette, Mich.	0	0	0	0.0	0.0
94. The Dalles, Ore.	0	1	0	0.0	0.0
95. Faribault, Minn.	0	0	1	0.0	0.0
96. Norfolk, Neb.	0	0	0	0.0	0.0
97. Boone, Iowa	0	0	1	0.0	0.0
98. Rocky River, Ohio	0	0	0	0.0	0.0
99. Watertown, Wis.	0	2	0	0.0	0.0
100. Astoria, Ore.	0	1	1	0.0	0.0
101. North Adams, Mass.	0	0	1	0.0	0.0
102. East Moline, Ill.	0	0	0	0.0	0.0

	Six Months 1958	1957	1956	1958 Reg. Rate	1958 Pop. Rate
103. Bristol, Va.	0	0	0	0.0	0.0
104. Fergus Falls, Minn.	0	0	0	0.0	0.0
105. So. Milwaukee, Wis.	**0**	**2**	**1**	**0.0**	**0.0**
106. Lamesa, Texas	0	0	0	0.0	0.0
107. Tempe, Ariz.	**0**	**2**	**1**	**0.0**	**0.0**
108. Winfield, Kans.	0	0	0	0.0	0.0
109. Naugatuck, Conn.	**0**	**1**	**0**	**0.0**	**0.0**
110. Mamaroneck, N. Y.	0	0	1	0.0	0.0
111. St. Joseph, Mich.	0	0	0	0.0	0.0
112. Hawthorne, N. J.	**0**	**3**	**0**	**0.0**	**0.0**
113. Villa Park, Ill.	0	0	1	0.0	0.0
114. Winnetka, Ill.	**0**	**1**	**0**	**0.0**	**0.0**
115. Conneaut, Ohio	0	0	0	0.0	0.0
116. Needham, Mass.	0	0	1	0.0	0.0
117. Livermore, Calif.	**0**	**2**	**0**	**0.0**	**0.0**
118. Hopewell, Va.	0	0	1	0.0	0.0
119. Escanaba, Mich.	**0**	**1**	**2**	**0.0**	**0.0**
120. Prescott, Ariz.	**0**	**1**	**1**	**0.0**	**0.0**
121. Beaver Dam, Wis.	0	0	1	0.0	0.0
122. Rye, N. Y.	**0**	**1**	**0**	**0.0**	**0.0**
123. Mitchell, S. D.	0	0	0	0.0	0.0
124. Virginia, Minn.	0	0	0	0.0	0.0
125. Ansonia, Conn.	**0**	**1**	**0**	**0.0**	**0.0**
126. Van Wert, Ohio	0	0	0	0.0	0.0
127. Du Bois, Pa.	0	0	1	0.0	0.0
128. Darien, Conn.	0	0	1	0.0	0.0
129. River Rouge, Mich.	0	0	3	0.0	0.0
130. Vernon, Conn.	0	0	2	0.0	0.0
131. Mansfield, Conn.	**0**	**1**	**1**	**0.0**	**0.0**
132. Central Falls, R. I.	0	0	0	0.0	0.0
133. Hays, Kans.	0	0	0	0.0	0.0
134. Grosse Pt. Wds., Mich.	0	0	0	0.0	0.0
135. Albion, Mich.	0	0	2	0.0	0.0
136. Menasha, Wis.	0	0	0	0.0	0.0
137. Bellefontaine, Ohio	0	0	0	0.0	0.0
138. University Hts., Ohio	0	0	1	0.0	0.0
139. Los Alamos, N. M.	0	0	0	0.0	0.0
140. Ecorse, Mich.	**0**	**1**	**0**	**0.0**	**0.0**
141. Red Wing, Minn.	0	0	0	0.0	0.0
142. Hornell, N. Y.	0	0	0	0.0	0.0
143. Charles City, Iowa	0	0	0	0.0	0.0
144. River Forest, Ill.	**0**	**1**	**0**	**0.0**	**0.0**
145. Bemidji, Minn.	0	0	0	0.0	0.0
146. Windsor, Conn.	0	0	3	0.0	0.0
147. Cadillac, Mich.	0	0	0	0.0	0.0
148. Grosse Pte. Pk., Minn.	**0**	**2**	**1**	**0.0**	**0.0**
149. Cudahy, Wis.	**0**	**2**	**0**	**0.0**	**0.0**
150. Swamscott, Mass.	0	0	0	0.0	0.0
151. Ironwood, Mich.	**0**	**1**	**1**	**0.0**	**0.0**
152. Two Rivers, Wis.	0	0	0	0.0	0.0
153. Milford, Mass.	0	0	0	0.0	0.0
154. Pacific Grove, Calif.	0	0	0	0.0	0.0

	Six Months 1958	1957	1956	1958 Reg. Rate	1958 Pop. Rate
155. La Salle, Ill.	0	0	0	0.0	0.0
156. Branford, Conn.	0	0	1	0.0	0.0
157. Moscow, Idaho	0	0	0	0.0	0.0
158. Fort Thomas, Ky.	**0**	**2**	**1**	**0.0**	**0.0**
159. Fairfield, Ala.	0	0	0	0.0	0.0
160. Ridgefield Pk., N. J.	**0**	**1**	**0**	**0.0**	**0.0**
161. Webster, Mass.	0	0	0	0.0	0.0
162. Derby, Conn.	**0**	**1**	**0**	**0.0**	**0.0**
163. Takoma Park, Md.	0	0	1	0.0	0.0
164. Killingly, Conn.	**0**	**2**	**0**	**0.0**	**0.0**
165. Donora, Pa.	0	0	1	0.0	0.0
166. Watertown, Conn.	**0**	**1**	**0**	**0.0**	**0.0**
167. Stonington, Conn.	**0**	**2**	**0**	**0.0**	**0.0**
168. Enfield, Conn.	0	0	2	0.0	0.0
169. Hollywood, Fla.	**1**	**3**	**0**	**0.9**	**8.8**
170. Covina, Calif.	1	1	1	1.0	11.8
All cities in this group				1.0	5.5
171. Ypsilanti, Mich.	**1**	**2**	**0**	**1.2**	**8.0**
172. Salisbury, S. C.	**1**	**4**	**1**	**1.5**	**9.5**
173. Homewood, Ala.	1	1	0	1.4	11.1
174. Lodi, Calif.	1	0	1	1.5	10.0
175. Uniontown, Pa.	1	0	1	1.5	9.4
176. Lawrence, Kans.	1	0	0	1.5	8.5
177. Kinston, N. C.	1	0	1	1.6	8.8
178. Endicott, N. Y.	1	0	1	1.7	10.2
179. Whitefish Bay, Wis.	1	0	0	1.7	10.9
180. Wooster, Ohio	1	1	0	1.8	12.4
181. Great Bend, Kans.	1	0	0	1.8	12.3
182. Bismarck, N. D.	1	0	0	1.8	9.0
183. Borger, Texas	1	0	1	1.8	11.0
184. Ames, Iowa	1	0	1	1.9	8.5
185. Port Chester, N. Y.	1	0	2	1.9	8.1
186. Westport, Conn.	**1**	**2**	**2**	**1.9**	**12.0**
187. Monterey, Calif.	1	1	0	2.0	9.2
188. Marietta, Ohio	1	1	0	2.0	12.1
189. Wheaton, Ill.	1	1	1	2.1	11.1
190. Wilmette, Ill.	1	0	2	2.1	8.1
191. Robbinsdale, Minn.	2	1	0	2.1	24.7
192. So. St. Paul, Minn.	1	0	0	2.1	11.6
193. Mt. Vernon, Ill.	1	0	1	2.1	12.5
194. Benton Harbor, Mich.	2	0	0	2.2	19.3
195. Leominster, Mass.	1	1	0	2.2	8.1
196. Calumet City, Ill.	**1**	**4**	**1**	**2.2**	**9.8**
197. East Lansing, Mich.	1	0	0	2.3	8.7
198. Stillwater, Okla.	1	1	0	2.3	9.9
199. Highland Park, Texas	1	0	0	2.3	16.4
200. Monroe, N. C.	1	1	1	2.4	19.0
201. Holland, Mich.	2	1	0	2.4	23.5
202. Newton, Kans.	1	0	1	2.5	15.2
203. Moses Lake, Wash.	**1**	**2**	**0**	**2.6**	**16.9**
204. Antioch, Calif.	1	1	1	2.6	12.9
205. Mt. Pleasant, Mich.	1	0	1	2.7	16.0

	Six Months 1958	1957	1956	1958 Reg. Rate	1958 Pop. Rate
206. So. Portland, Me.	1	1	0	2.7	8.2
207. Santa Paula, Calif.	1	0	0	2.7	16.4
208. Attleboro, Mass.	1	0	0	2.7	8.0
209. So. Orange, N. J.	1	0	0	2.8	12.3
210. El Cerrito, Calif.	1	1	2	2.8	8.5
211. Sault Ste. Marie, Mich.	1	1	0	2.9	11.2
212. Wethersfield, Conn.	**1**	**2**	**1**	**2.9**	**12.2**
213. Longview, Wash.	2	0	0	3.0	17.2
214. Atchison, Kans.	1	0	0	3.0	15.6
215. Albany, Calif.	1	0	0	3.0	11.4
216. Statesville, N. C.	2	0	0	3.1	22.7
217. Gardner, Mass.	1	0	1	3.1	10.0
218. Logan, Utah	1	0	0	3.3	11.9
219. Bowling Green, Ohio	1	1	0	3.3	14.3
220. Lufkin, Texas	2	0	0	3.3	23.0
221. Santa Cruz, Calif.	3	1	1	3.4	26.3
222. Orange, Calif.	2	2	2	3.4	18.8
223. Ocala, Fla.	2	1	5	3.5	28.0
224. Marinette, Wis.	1	0	1	3.6	14.1
225. Denison, Texas	2	1	3	3.9	19.2
226. Ottawa, Ill.	2	2	1	4.0	22.2
227. Bellaire, Ohio	1	0	0	4.0	15.9
228. Winchester, Conn.	1	1	0	4.0	19.0
229. West Lafayette, Ind.	1	0	0	4.1	15.3
230. Stoughton, Mass.	1	0	0	4.1	14.5
231. Groton, Conn.	1	0	4	4.1	9.1
232. Aberdeen, S. D.	2	1	1	4.2	18.1
233. Xenia, Ohio	2	1	1	4.2	24.5
234. Beacon, N. Y.	**1**	**2**	**0**	**4.2**	**13.3**
235. Southington, Conn.	**1**	**2**	**2**	**4.3**	**15.3**
236. Moorhead, Minn.	2	0	0	4.7	22.5
237. La Porte, Ind.	3	3	0	4.7	28.3
238. Ashland, Wis.	1	0	1	4.8	18.9
239. Massena, N. Y.	2	1	0	4.9	25.0
240. Bloomington, Minn.	3	1	1	5.1	47.6
241. Windham, Conn.	2	2	2	6.0	25.2
242. Brawley, Calif.	2	1	1	6.0	29.9
243. W. Springfield, Mass.	3	0	2	6.3	26.2
244. Marshfield, Wis.	3	0	0	9.1	44.1
245. North Chicago, Ill.	3	1	3	11.4	32.4
246. Shelton, Conn.	4	1	0	12.4	48.8
CANADIAN CITIES					
Red Deer, Alta.	0	0	0	—	0.0
Medicine Hat, Alta.	0	0	0	—	0.0
Edmonton, Alta.	2	5	8	—	2.5
Calgary, Alta.	3	3	6	—	4.6
Lethbridge, Alta.	1	3	0	—	8.7
Montreal, Que.	45	73	56	—	8.8
Vancouver, B. C.	16	17	17	—	9.3
Toronto, Ont.	69	61	33	—	10.0
Hamilton, Ont.	11	12	15	—	10.6

TRAFFIC DEATHS—STATE RECORDS

Deaths are reported by state traffic authorities.

All figures are preliminary. To insure proper comparisons, 1957 and 1956 figures cover the same reporting period as those for 1958.

States shown in heavy type have improved in 1958 compared with 1957, or showed no change.

Mileage Rate: The number of deaths per 100 million vehicle miles of travel.

(Figures in parenthesis following the 1958 mileage rate indicate the number of months for which the mileage rate is calculated for each state.)

*Less than .5%.

	Months Reported	Deaths Identical Periods 1958	1957	1956	% Changes 1957 to 1958	1956 to 1958	1958 Pop. Rate	1958 Mile. Rate	
TOTAL U.S.	6	16,240	17,510	17,948	— 7%	— 10%	21.0	5.1	(4)
Ala.	**6**	**378**	**428**	**441**	**— 12%**	**— 14%**	**24.0**	**6.9**	**(4)**
Ariz.	6	230	222	205	+ 4%	+ 12%	40.5	8.6	(4)
Ark.	**6**	**182**	**236**	**209**	**— 23%**	**— 13%**	**20.6**	**5.4**	**(5)**
Calif.	**6**	**1,571**	**1,651**	**1,690**	**— 5%**	**— 7%**	**22.6**	**4.8**	**(4)**
Colo.	6	161	138	175	+ 17%	— 8%	19.2	4.2	(3)
Conn.	**6**	**87**	**134**	**127**	**— 35%**	**— 31%**	**7.7**	**2.1**	**(4)**
Del.	**6**	**36**	**42**	**40**	**— 14%**	**— 10%**	**16.4**	**4.5**	**(4)**
D. of C.	6	26	31	31	— 16%	— 16%	6.3	2.1	(4)
Fla.	6	550	528	608	+ 4%	— 10%	26.8	5.8	(4)
Ga.	**6**	**416**	**459**	**528**	**— 9%**	**— 21%**	**22.0**	**5.3**	**(2)**
Idaho	6	108	84	109	+ 29%	— 1%	33.8	6.8	(3)
Ill.	**6**	**802**	**1,026**	**938**	**— 22%**	**— 14%**	**16.6**	**4.3**	**(2)**
Ind.	**6**	**425**	**510**	**535**	**— 17%**	**— 21%**	**18.8**	**4.4**	**(2)**
Ia.	**6**	**256**	**318**	**307**	**— 19%**	**— 17%**	**18.3**	**5.3**	**(4)**
Kans.	**6**	**223**	**249**	**300**	**— 10%**	**— 26%**	**20.9**	**4.8**	**(4)**
Ky.	**6**	**356**	**378**	**340**	**— 6%**	**+ 5%**	**23.4**	**7.7**	**(4)**
La.	6	411	352	401	+ 17%	+ 2%	26.8	8.4	(4)
Me.	**6**	**59**	**60**	**54**	**— 2%**	**+ 9%**	**12.5**	**2.9**	**(4)**
Md.	**6**	**250**	**259**	**237**	**— 3%**	**+ 5%**	**17.3**	**5.1**	**(4)**
Mass.	6	253	207	254	+ 22%	— *%	10.4	3.3	(4)
Mich.	**6**	**545**	**675**	**783**	**— 19%**	**— 30%**	**14.0**	**3.9**	**(4)**
Minn.	6	309	290	215	+ 7%	+ 44%	18.6	4.1	(4)
Miss.	6	224	212	239	+ 6%	— 6%	20.5	6.1	(4)
Mo.	**6**	**397**	**473**	**511**	**— 16%**	**— 22%**	**18.7**	**4.1**	**(3)**
Mont.	**6**	**82**	**87**	**116**	**— 6%**	**— 29%**	**24.6**	**5.0**	**(4)**
Neb.	**6**	**145**	**123**	**139**	**+ 18%**	**+ 4%**	**20.0**	**4.4**	**(4)**
Nev.	**6**	**55**	**52**	**64**	**+ 6%**	**— 14%**	**41.2**	**5.0**	**(4)**
N. H.	**6**	**34**	**36**	**41**	**— 6%**	**— 17%**	**11.9**	**2.2**	**(4)**
N. J.	**6**	**346**	**388**	**360**	**— 11%**	**— 4%**	**12.3**	**3.1**	**(4)**
N. M.	**6**	**162**	**183**	**178**	**— 11%**	**— 9%**	**39.0**	**8.3**	**(3)**
N. Y.	6	960	906	932	+ 6%	+ 3%	12.1	4.4	(4)
N. C.	**6**	**433**	**494**	**506**	**— 12%**	**— 14%**	**19.3**	**5.5**	**(4)**
N. D.	6	70	41	64	+ 71%	+ 9%	21.7	—	—
Ohio	**6**	**815**	**932**	**929**	**— 13%**	**— 12%**	**17.7**	**4.6**	**(4)**
Okla.	**6**	**311**	**311**	**299**	**0%**	**+ 4%**	**27.3**	**5.7**	**(4)**
Ore.	**6**	**176**	**198**	**188**	**— 11%**	**— 6%**	**19.9**	**5.1**	**(4)**
Pa.	**6**	**673**	**753**	**827**	**— 11%**	**— 19%**	**12.2**	**3.7**	**(4)**
R. I.	**6**	**35**	**39**	**24**	**— 10%**	**+ 46%**	**8.5**	**2.4**	**(4)**
S. C.	**6**	**256**	**344**	**315**	**— 26%**	**— 19%**	**21.6**	**6.5**	**(4)**
S. D.	6	101	65	76	+ 55%	+ 33%	28.8	10.8	(4)
Tenn.	6	322	291	348	+ 11%	— 7%	18.6	4.9	(4)
Texas	**6**	**1,008**	**1,158**	**1,135**	**— 13%**	**— 11%**	**22.1**	**4.8**	**(4)**
Utah	**6**	**86**	**91**	**100**	**— 5%**	**— 14%**	**20.2**	**4.2**	**(4)**
Vt.	**6**	**27**	**44**	**42**	**— 39%**	**— 36%**	**14.4**	**2.4**	**(4)**
Va.	**6**	**376**	**394**	**383**	**— 5%**	**— 2%**	**19.8**	**5.0**	**(4)**
Wash.	6	243	226	224	+ 8%	+ 8%	17.9	4.7	(4)
W. Va.	6	152	224	191	— 32%	— 20%	15.4	—	—
Wis.	**6**	**346**	**367**	**448**	**— 6%**	**— 23%**	**17.9**	**4.6**	**(4)**
Wyo.	6	60	54	64	+ 11%	— 6%	38.0	6.0	(4)
CANADIAN PROVINCES									
Alta.	6	131	90	92	+ 46%	+ 42%	27.9	—	—
B. C.	4	70	63	63	+ 11%	+ 11%	18.0	—	—
Man.	5	30	39	36	— 23%	— 17%	9.3	—	—
Sask.	6	57	46	32	+ 24%	+ 78%	13.7	—	—

MOTOR-VEHICLE DEATHS AND INJURIES BY STATES — 1958 and 1957

Forty-three states and the District of Columbia report their death and injury experience for four months or less.

Injury totals and changes should be interpreted with some caution because of the effect of continuing changes in insurance laws and reporting requirements, efforts among many states to get more complete reporting, and increasing claims consciousness of those involved in accidents.

MOTOR-VEHICLE DEATHS AND INJURIES BY STATES 1958 and 1957

	Months Reported	Deaths††		Injuries††		% Change 1957 to 1958		1958 Ratio of Injuries to Deaths
		1958	1957	1958	1957	Deaths	Injuries	
TOTAL								
U. S.	**	8,674¶	9,536¶	384,619	370,288	— 9¶	+ 4	44
Ala.	4	242	285	1,386†	1,469†	— 15	— 6	6
Ariz.	4	155	156	2,896	2,448	— 1	+ 18	19
Ark.	4	121	179	1,069	882	— 32	+ 21	9
Calif.	4	986	1,058	42,191	42,630	— 7	— 1	43
Colo.	4	83	78	3,299	2,789	+ 6	+ 18	40
Conn.	4	58	72	6,736	6,298	— 19	+ 7	116
Del.	4	25	24	613	676	+ 4	— 9	25
D. of C.	4	16	19	2,110	2,111	— 16	— *	132
Fla.	3	289	304	8,031	8,677	— 5	— 7	28
Ga.	4	258	302	4,692	2,865	— 15	+ 64	18
Idaho								
Ill.	4	509	647	28,416	28,371	— 21	+ *	56
Ind.	4	260	318	10,095	11,334	— 18	— 11	39
Ia.	4	184	188	5,441	6,094	— 2	— 11	30
Kan.	4	135	166	4,139	3,088	— 19	+ 34	31
Ky.	4	235	234	4,184	3,781	+ *	+ 11	18
La.								
Me.	4	31	34	2,239	1,480	— 9	+ 51	72
Md.	4	162	156	5,420	5,652	+ 4	— 4	33
Mass.	3	118	87	22,612	21,005	+ 36	+ 8	192
Mich.	4	358	421	15,433	17,295	— 15	— 11	43
Minn.	4	171	183	7,203	6,481	— 7	+ 11	42
Miss.	4	142	125	2,012	1,909	+ 14	+ 5	14
Mo.	4	239	294	2,927	3,380	— 19	— 13	12
Mont.	4	54	51	665	600	+ 6	+ 11	12
Neb.	4	80	74	2,514	2,659	+ 8	— 5	31
Nev.								
N. H.	4	14	25	1,660	1,642	— 44	+ 1	119
N. J.	1	71	62	4,765	4,277	+ 15	+ 11	67
N. M.	4	102	107	1,587	1,335	— 5	+ 19	16
N. Y.	4	593	587	84,637	74,656	+ 1	+ 13	143
N. C.	4	271	321	5,814	5,579	— 16	+ 4	21
N. D.	2	13	9	291	244	+ 44	+ 19	22
Ohio	4	531	567	21,976	23,603	— 6	— 7	41
Okla.	4	181	195	4,258	4,196	— 7	+ 1	24
Ore.	4	117	120	5,055	4,553	— 3	+ 11	43
Pa.	4	432	467	24,909	24,804	— 7	+ *	58
R. I.								
S. C.	4	167	229	3,037	3,300	— 27	— 8	18
S. D.	2	36	12	510	335	+200	+ 52	14
Tenn.	4	195	184	4,081	4,025	+ 6	+ 1	21
Texas	4	656	726	19,633	19,656	— 10	— *	30
Utah	4	47	59	1,527	1,433	— 20	+ 7	32
Vt.	4	10	30	835	851	— 67	— 2	84
Va.								
Wash.	4	157	144	8,569	7,042	+ 9	+ 22	55
W. Va.	4	92	136	2,195	2,223	— 32	— 1	24
Wis.	1	47	62	2,422	1,983	— 24	+ 22	52
Wyo.	4	31	39	537	597	— 21	— 10	17

†Rural injuries only.
††All figures are preliminary. To insure proper comparisons, 1957 figures cover the same reporting period as those for 1958.
*Less than .5%.
**Death and injury totals cover reports for all months indicated in this column.
¶Death totals and changes differ from national figures because those shown here are based on the states and months for which injury data are reported.

Utah Program

From Page 19

since its beginning in November, 1957. This information was obtained from the accident records bureau, which is a part of our department.

Accident statistics for the month of January are not available at the time of this writing for police and sheriff departments. It could probably be assumed, however, that the amount of increase in accident reporting in these two agencies would be similar to that of the highway patrol.

In addition to the above reported accidents there were over 1,000 non-reportable accidents checked by officers and on which files are kept in the various patrol headquarters throughout the state.

Accident statistics in our state for the year 1957 will show a distorted picture in relation to previous years' experience. On the surface this may look bad but I am sure that the same thing would apply in any state should they adopt this program. On the other hand, we will be accumulating more accurate statistics in relation to our accidents.

In any event, we feel that this program has been very effective for many reasons. It has put an end to the "You fix your car and I'll fix mine and we won't call the police," or "I am in the wrong. I will fix your car. Send me the bill and there is no need to call the police," along with the fact that it has proved a great deterrent to hit-and-run drivers. Admittedly, there are still some bugs in the program which must be ironed out. Cooperation from all police agencies investigating accidents is necessary. This was obtained in Utah by personal contact with these officers, by members of the Utah Highway Patrol and by letter.

Anticipating some of the problems which would naturally arise, and many questions which would be asked, the highway patrol issued a *Suggested Procedure for the Use of Damaged Vehicle Release Stickers,* which was distributed to all police agencies within the state.

Everything being considered, I believe that Utah has a very effective and worthwhile program which might be given consideration by other states if possible under their existing laws.

THE SAFETY LIBRARY

By Ruth Parks, Librarian, NSC

Books, pamphlets, and articles of interest to safety men.

Accidents

Analysis of Causes and Violations Contributing to a Traffic Accident. *Traffic Digest & Review*, p.1-8, June, 1958. (Traffic Institute Publication No. 1921.)

Ohio Turnpike Accident Study. B. H. Bowman, *Traffic Engineering*, p.23-26, June, 1958.

Commercial Vehicles

Fleet Safety Major Saving. A. D. Turner, *Motor Truck & Coach*, p.24-26, June, 1958.

Drivers and Driving

An Analytical Report on Driver Improvement Schools, With Recommendations for Improving Safety. Sherm G. Finesilver, 28p., 1958. Municipal Courts, West Side Court Bldg., West Colfax & Kalamath, Denver, Colo.

(This report culminates an extensive and detailed two-year study of all phases of traffic safety education, licensing and enforcement.)

Other People's Mistakes. *California Highway Patrolman*, p.12-15, June, 1958.

Driver Licensing

Drastic Driver Licensing and Control Measures. *California Highway Patrolman*, p. 52+, June, 1958.

Legal Aspects for Driver Licensing. Leo E. Smith. *Traffic Digest & Review*, p. 9-15, June, 1958.

(The second in a series of articles in this important area of traffic safety.)

Drugs

How Pills Can Be An Unknown Enemy. Harold Brandaleone. *Fleet Owner*, p.36, June, 1958.

(The same medicines that cure ailments can lead to bad accidents.)

Economics

The Economic Costs of Motor-Vehicle Accidents of Different Types. Robie Dunman. *Public Roads*, p.40-44, June, 1958.

Prompt Accident Investigations Help Reduce Expensive Claims. *Taxicab Industry*, p. 7+, June, 1958.

Engineering

Accident Study. G. M. Webb. *California Highways and Public Works*, p. 29-32, May-June, 1958.

The Relationship of Engineering Science to Highway Safety. Charles W. Prisk. *Traffic Engineering*, p.11-14, June, 1958.

Special Delineators Help Reduce Accidents. J. P. Mills, Jr. *Better Roads*, p. 19-20+, June, 1958.

Grade Crossings

Maximum Safe Vehicle Speeds at Railroad Grade Crossings. Arnold A. Johnson. *Traffic Engineering*, p. 20-22+, June, 1958.

Headlights

Polarized Light Sees Through Fog. *Safety Maintenance*, p. 13, June, 1958. (Polarization technique increases contrast — and thus visibility — in fog, haze and smoke.)

Highways

King-Size Test Road Holds Future Answers. *Engineering News-Record*, June 19, 1958, p. 52-55.

Safety Shoulders of Red Jiggle Bars Provide Haven for Disabled Vehicles on Bridge in Houston, Texas. Don V. Purington. *Better Roads*, p. 23, June, 1958.

Lighting

Advanced Lighting for Chicago's New Toll Skyway. Frank W. Hinze. *Street Engineering*, p. 22-24, July, 1958.

Bright Lights at Busy Interchange. *The American City*, p. 123-124, July, 1958.

(Adequate lighting for New Orleans Expressway.)

Point System

Ohio Point System and Traffic Courts. James P. Economos. *Ohio State Law Journal*, p. 448-459. Winter Quarter, 1957. (Reprint)

(Some problems that may confront the courts in enforcing point system legislation.)

Psychology

The Mind and the Motorist. A symposium sponsored by the Nebraska Psychiatric Institute and *The Omaha World-Herald*, 72 p., 1957, Nebraska Psychiatric Institute, 602 South Forty-Fourth Avenue, Omaha 5, Nebr.

(A symposium on psychological factors contributing to traffic accidents.)

Research

Research as Applied to Traffic and Transportation. K. A. Stonex, 15 p., May, 1958. General Motors Proving Grounds, Milford, Mich.

(For presentation at the Tenth Missouri Traffic Conference, University of Missouri.)

Wind Tunnel for Aerodynamic Testing of Section Models of Suspension Bridges. The Discussion of Physical Research, Bureau of Public Roads. *Public Roads*, p. 51-52, June, 1958.

School Buses

The Intricacies of School Bus Operation Explained to the Nation's Parents. Robert H. Manning. (School Bus Trends) *Mass Transportation*, p. 22-25, June, 1958.

Problems of School Bus Operation. Hugh K. Cassell. (School Bus Trends) *Mass Transportation*, p. 30-31, June, 1958.

The Responsibility of the School Bus Operator. Joseph A. Bendner. (School Bus Trends) *Mass Transportation*, p. 19-20, June, 1958.

Signs and Signals

Metropolitan Wayne County Installs First 960 MC (Microwave Band) Signal Controls. *Street Engineering*, p. 24, *nal*, p. 202, June, 1958.

Radio Control of Traffic Signs Begun in Wayne County. *Traffic Engineering*, p. 28-29, June, 1958.

Wind Loading Tests on Aluminum Sign Supports. J. F. O'Keefe and E. D. Gardner. *Civil Engineering*, p. 65-66, June, 1958.

Transit

A Hard-Working PM Program. Dick Bush. *Mass Transportation*. p. 42-43, June, 1958.

Vision

Sun Glasses on Bright Days Improve Vision After Dark. Dr. W. Schweisheimer. *Commercial Car Journal*, p. 202, June, 1958.

ADDRESSES OF MAGAZINES MENTIONED

The American City
Buttenheim Publishing Corp.
470 Fourth Ave.
New York 16, N. Y.

Better Roads
A. Perrin
Publisher
173 W. Madison St.
Chicago 11, Ill.

California Highways and Public Works
P.O. Box 1499
Sacramento, Calif.

California Highway Patrolman
California Association of Highway Patrolmen
1213 H St.
Sacramento, Calif.

Civil Engineering
American Society of Civil Engineers
33 W. 39th St.
New York, N. Y.

Commercial Car Journal
Chilton Co.
56th & Chestnuts Sts.
Philadelphia 39, Pa.

Engineering News-Record
McGraw-Hill Publishing Co.
330 W. 42nd St.
New York 36, N. Y.

Fleet Owner
McGraw-Hill Publishing Co.
330 W. 42nd St.
New York 36, N. Y.

Mass Transportation
Hitchcock Publishing Co.
Wheaton, Ill.

Motor Truck & Coach
The Monetary Times Printing Co. of Canada, Ltd.
341 Church St.
Toronto, Canada

Ohio State Law Journal
College of Law
Ohio State University
Columbus, Ohio

Public Roads
Superintendent of Documents
Washington 25, D. C.

Safety Maintenance
Alfred M. Best Co.
75 Fulton St.
New York 7, N. Y.

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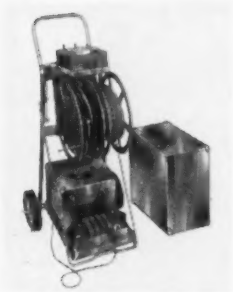

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Street Engineering
Gillette Publishing Co.
22 W. Maple St.
Chicago 10, Ill.

Taxicab Industry
Auto Rental News
Taxi Weekly, Inc.
200 W. 57th St.
New York 19, N. Y.

Traffic Digest & Review
Northwestern University Safety Traffic Institute
1804 Hinman Ave.
Evanston, Ill.

Traffic Engineering
The Institute of Traffic Engineers
2029 K St., N.W.
Washington 6, D. C.

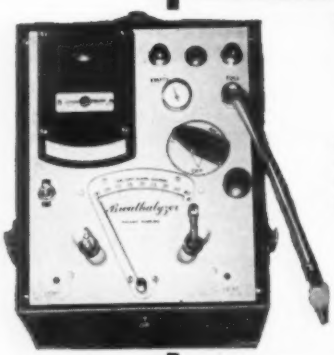
Danger on Two Wheels

From Page 13

with adequate penalties. Enforcement officers should be instructed that a "minor" violation by a scooter operator can be more lethal than a similar violation by an automobile, and that accident *prevention* is a necessity where these vehicles are concerned.

Progress brings with it new hazards, but the experience of industrial safety engineers proves there is no hazard which cannot be controlled. In my opinion, our philosophy regarding motor scooters has been like the plant that installs new machinery, then assigns a completely ignorant employee to operate it so they can find out how hazardous it is. If we want to live with the motor scooter we must allow its operation only by thoroughly trained, mentally competent personnel, equip it with adequate safety devices, then add sufficient enforcement for infractions of the operating rules.

Circle Item No. 8—Reader Service Card



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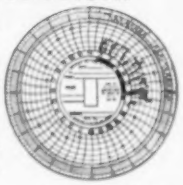

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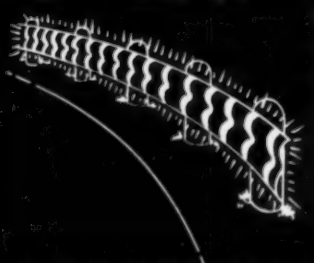

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INDEX AVAILABLE

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Mail Bag

From Page 2

railroads to have locomotives operating on the line turn on their headlights. This is done because a headlight gives clearer notice of the train at a greater distance, even in full daylight, than would otherwise be possible. The adoption of a similar rule for automobiles would be a big factor in reducing the number of highway accidents.

Nearly all states have rules requiring that headlights be turned on at sundown or at times of impaired visibility, but this introduces the uncertain element of the individual driver's judgment. When is sundown and sunrise and when is the visibility impaired?

Another thing which adds to the desirability of daytime use of headlights is the amphisbaenic design of modern cars so that "he who runs"—or drives—can be easily confused about whether a car is coming or going. I think I read an article in a newspaper not very long ago in which the chief of police of Miami, Fla., had made some tests and discovered how few people could tell at a distance whether they were looking at the rear or front of a car.

One safe way to assure maximum safe conditions where headlights are a factor is to make it "a must" to have them turned on when cars and trucks are moving on the highways.

Will Cooper
Past Treasurer
National Safety Council

Dear Editor:

Please send me a reprint of the article "From Chaos to Control" that appeared in the July issue of TRAFFIC SAFETY.

I am working on a research study for the Legislative Interim Fact Finding Committee which involved improvements in the driver licensing and driver improvement operation of the state license department.

I would like to quote from this article in my report giving credit, of course, to TRAFFIC SAFETY.

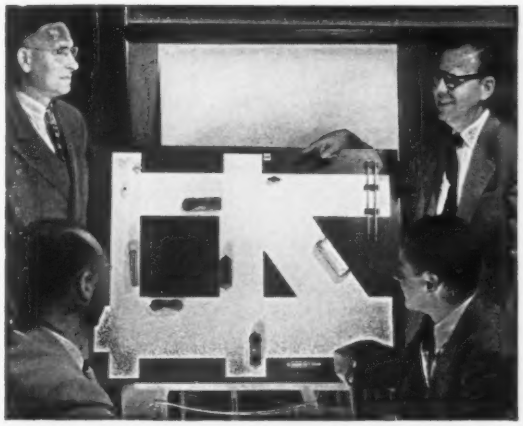
Edward G. Brown
Professor, College of
Business Administration
University of Washington

Dear Editor:

Both Bill Schultz at West Point and I have received several inquiries as a result of your article on "Multi-Colored Highway Safety Design." One was from the safety director of the United States Army Southern Task Force in Italy. Progress is being made with some highway officials in several cities, as well, and we will keep you advised as this safety design develops in use.

Gerard C. Deane
Post Safety Director
Ft. Hamilton, N. Y.

Circle Item No. 11—Reader Service Card



THE "EYES" HAVE IT . . . .

Here is an aid that has proven practical in teaching visually the principles of safety. It's simple, effective and works wonders in teaching your drivers.
The MAGNO SAF-T BOARD is the result of studies by outstanding safety instructors and engineers. Safety directors, traffic managers, driving instructors, insurance agents and adjusters get a clear picture of how accidents occurred visually by reconstruction of conditions.
It is now being used from coast to coast by fleet owners, insurance and public utility companies, colleges and schools, and many other concerns interested in public safety. Consisting of a BOARD with typical street intersections on one side. The other side is a BLACKBOARD on which any street or road situation can be drawn with chalk and then erased. It has scale models of vehicles, traffic markers and accessories that can be placed in any conceivable traffic situation.

Write for our folder. It contains full information.

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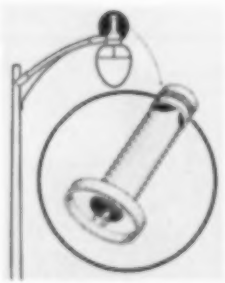
NEW... SAFETY EQUIPMENT

Publication of product announcements in this section should not be construed as endorsement or approval by the National Safety Council.



Floodlight Control

Model 3158 with a photo-electric cell that is sensitive to light and darkness, is used to automatically turn flood lights, street lights, warning lights, etc., on when darkness approaches, regardless of the hour and off when daylight comes or when illumination is not needed.

One of the floodlight controls can control 2,000 watts of fluorescent or neon lights or 1,000 watts of incandescent lights. By using a power contactor it can control a bank of lights with an unlimited load. The three contact, twist-lock plug in the base makes it easy to install this new control onto various types of light fixtures.

The photo-electric cell in the control is easily adjusted to respond to various light levels between ½ to 100 foot candles of daylight. The light-level scale on the side of the control makes it possible to set several controls in different areas to operate at a pre-determined light level.

The snap action mercury switch with tungsten to mercury contacts is hermetically sealed to eliminate pitting and corrosion. There are no vacuum tubes or other electronic parts or exposed contacts in the control. The four glass covered light-entrance ports in the aluminum metal housing are permanently sealed with compressed O-rings. The control can be installed at up to a 30 degree angle and can withstand considerable vibration and is not affected by temperature changes.

Roth Manufacturing Co., Dept. 178, 6420 West Howard Street, Chicago 31, Illinois. (Item 41)

Chemical Spray Gun

Flexible, abrasion resistant polyamide tubing has been successfully applied to transmit 100 per cent reactive epoxy resin in a chemical spray gun used to paint traffic lines.

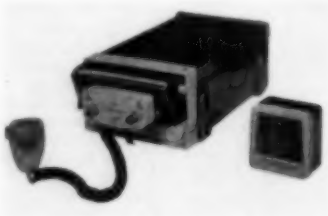
Over 250 feet of $\frac{5}{16}$" and $\frac{3}{16}$" tubing known as Nylaflow pressure tubing, is subjected to four different sets of requirements in the handling of resin, hardener, hot water and air in chemical spray equipment.

The tubing is chemically resistant, does not contaminate corrosive fluids, is light, flexible and compact and is not subject to abrasive wear. A casing less than 1" O.D. encloses all five tubes carrying resin, hardener, water (2), and air from the pumping unit to the spray gun. Inside the pumping equipment, the tubing is used for all necessary plumbing. The translucent tubing walls allow visual check of fluid flowing at all points in the chemical spray equipment.

The air hose operates at 100 psi pressure. Two lines carry water heated to 180°F. Although this specially processed nylon tubing serves a wide range of temperatures from —100°F to +225°F, it is not recommended for continuous use in an oxidizing atmosphere above 180° or with hot water above 150°.

Inside the pumping unit, the flexible tubing replaces all copper plumbing. Installation has proven easier as no pre-forming is necessary and the tubing can be bent to the desired curvature. All the lines are continually being flexed and bent as the operator weaves the spray gun back and forth. The tubing offers little resistance to operator movement as it remains flexible under the wide range of heat, corrosive and abrasive conditions encountered in this equipment.

The Polymer Corp. of Pennsylvania, 2140 Fairmont Ave., Reading, Pa. (Item 42)



Radiophone

A mobile, 2-way radiophone operating in the 450-470 MC. frequency band features a transistorized power supply and an advanced unified chassis design.

The equipment utilizes transistors in the power supply rather than the traditional mechanical vibrators. The unit makes "T-Power" radio available in all frequency bands and conventional ratings.

Long trouble free life is one characteristic of the transistor so its utilization in the power supply provides the user with increased reliability and efficiency.

The unified chassis design, which combines transmitter, receiver and power supply portions of the unit on one chassis rather than three, plus many other design features aids overall equipment reliability.

The model weighs 34 pounds and is packaged in a narrow 10 inch housing, enabling both under-dash and trunk mounting.

The 450-470 MC. radiophone provides 18 watts transmitter power output and a new high of 3 watts receiver output. It is available in both carrier squelch and dual squelch versions. The unit operates from a 12 volt electrical system, positive or negative ground.

Motorola Communications and Electronics, Inc., 4501 West Augusta Boulevard, Chicago 51, Illinois. (Circle Item 43)

Highway Standard

Highway standard, Model S-1000, for use with both Neon and transistor flasher lights has a heavy steel base to prevent tipping. A specially designed hood gives excellent daylight visability. To thwart theft, the warning light locks onto the standard.

The unit is designed for use on construction projects, road or street hazards or for use as an in-plant warning signal. The S-1000 standard occupies less space than conventional warning barricades since the diameter of the base is only 18 in.

Pacific Mercury, 14052 Burbank Blvd., Van Nuys, Calif. (Item 44)

Mercury Vapor Lamp

The first blown tubular-shaped 100-watt mercury vapor lamp is known as BT-25 and is said to provide greater support for the mercury arc tube in withstanding vibration or shock.

The model is offered in clear and color-improved types and the line includes 175, 250, 400, 700, and 1,000-watt models.

The tubular shape provides support at both the top and base of the lamp so that the arc tube is held stationary despite vibration or shock. As a result of the support, the optics of refractor or reflector equipment will remain constant throughout the life of the lamp. The lamps are designed to provide a higher degree of safety for night drivers on the nation's highways, better illumination for residential and business streets, and improved industrial lighting.

The lamps are claimed to produce from 10 to 20 per cent more light output than standard mercury vapor lamps.

Sylvania Electric Products, Inc., 1740 Broadway, New York 19, N. Y. (Item 45)

Portable Megaphone

New "TP" (transistor-powered) Audio Hailer portable megaphones project speech over half a mile. The units are self-contained and operate on standard flashlight cells. The amplifier uses 4 new-type power-transistors to produce an output of 7 watts, 115 db. Other features are the patented "anti-feed-back" construction, encapsulated (hermetically-sealed) transformers, and controlled reluctance microphone. The "TP" Hailer weights 5¾ lbs. with a pistol-grip for one-hand operation.

The previous tube-amplifier model is widely used by industrial safety and plant protection departments and by municipal fire and police departments. It is possible to install a complete new "TP" chassis in units now in use. This doubles acoustic power and reduces battery maintenance cost.

Audio Equipment Co., Inc., 75 Harbor Road, Port Washington, N. Y. (Item 46)

Emergency Cutting Kit

The "Savalife" kit is a lightweight, compact, low cost portable emergency cutting outfit with a heavy duty torch for cutting steel and a first aid inhalator that gives up to 6 liters of pure oxygen.

The unit is designed for use by rescue squads, fire and police departments and industrial safety departments.

The easily-carried and operated unit is housed in a strong, spot-welded, all-aluminum case that can be used in hard-to-reach areas.

Sufficient gases are provided to cut up to 1½" of steel for 2 hours and a reserve, throw-away gas cylinder is enclosed in the case.

A deep drawer built in the top part of the case holds a complete set of accessories including goggles, gloves, spark lighter, wrench, spare tip, inhalator and instruction book. When the top section of the box is removed, 10' of dual hose and the cylinders are exposed ready to be turned on. A needle valve "take-off" on the outlet of the oxygen regulator makes it possible to use an oxygen inhalator provided with the unit. The kit meets and exceeds Civil Defense Specifications M-6 Item CD VIII-66.

Gas Arc Supply, 223 N. 16th St., Philadelphia 2, Pa. (Item 47)

Reflective Glass Beads

UB 68 is a reflective glass bead for application to backgrounds of thruway signs. The ultra light bead in the medium index classification is recommended for use on signs in the darker pigmented colors such as greens, blues, and reds.

Designed for 'round-the-clock protection of motorists, the bead has impressive reflectability under all weather conditions and offers maximum possible angularity up to the point of passing. Chemical stability, long life, ease of application, and a minimum of maintenance are claimed for the product, qualifying it for large reflectorized overhead signs, distance and destination signs, red stop signs, etc.

Flex-O-Lite Mfg. Corp., 8301 Flex-O-Lite Drive, P. O. Box 3066 (Affton Br.) St. Louis 23, Mo. (Item 48)

SAFETY PRODUCT LITERATURE

Truck-Mounted Backhoe for Chevrolet Trucks

Designed for complete mobility as well as digging ability, the new Ottawa truck-mounted backhoe travels at regular truck speeds, is ready to dig in seconds after arrival at jobsite. Digs 12½ feet deep in any position of 190° arc. Two levers control all bucket and boom actions. Automatic ejectors force all sticky material from bucket without loss of time. Powerful hydraulic system exerts 7000 lbs. digging force at bucket cutting edge. Folder gives full details. Ottawa Steel Division, Young Spring and Wire Corp., Ottawa, Kans.

For more details circle No. 81 on enclosed return postal card.

Signs for Streets, Roads, Highways

Signs accepted for standard use by progressive municipalities throughout the country are featured in a new catalog available from Municipal Street Sign Co., 777 Meeker Ave., Brooklyn 22, N. Y. Crisscross or wing style, porcelain and baked enamel, cast aluminum, framed and unframed—any type street sign—all offering durability, economy, legibility.

For more details circle No. 82 on enclosed return postal card.

Electrical Equipment for Lighting and Traffic

Bulletin 2706 describes the electrical products and manufacturing facilities of the Crouse-Hinds Co., Syracuse 1, N. Y., with special emphasis on the variety of equipment available in the company's four product lines of conduilet electrical equipment, floodlights, aviation lighting equipment, and traffic control.

For more details circle No. 83 on enclosed return postal card.

For More Extensive Traffic Control

The Harley-Davidson Solo gives flexibility to motorcycle fleets. It enables officers to cover more territory and to get where they're needed in the shortest possible time. Designed for on-the-job comfort and surefootedness, it minimizes officer fatigue. Harley-Davidson Motor Co., Milwaukee 1, Wis.

For more details circle No. 84 on enclosed return postal card.

Parking Fines Paid On the Spot

The Duncan Fine-O-Meter system of fine collection is being used in hundreds of municipalities. The over-timer merely deposits the prescribed fine in a box attached to the parking meter post. He puts the money in a convenient ticket envelope printed to meet a city's requirements. Duncan Parking Meter Corp., 835 N. Wood St., Chicago 22, Ill.

For more details circle No. 85 on enclosed return postal card.

Towmaster Heavy Duty Tractor Retriever for Truck Fleets

Bulletin describes a five-ton capacity truck towing crane, which mounts to the fifth wheel of any truck tractor. This saves tow charges, and costs but a fraction of a heavy special purpose vehicle. One man can attach the Watson "Towmaster" to a tractor, and retrieve a truck or bus—without prior wrecker training. When not in use, the Towmaster can be detached and stored; therefore, no particular tractor need be tied up full time as a retrieving vehicle. H. S. Watson Co., 1316—67th St., Emeryville, Calif.

For more details circle No. 86 on enclosed return postal card.

Plastic Traffic Markers

These highly reflective, brightly colored plastic traffic signs are precoated to go down fast and adhere permanently to street surfaces, even when subjected to the severest traffic conditions. Brochure describes and illustrates Nefslabs, markers, strips and arrows and Nefmats, traffic signs. J. W. Neff Laboratories, Inc., Stockertown 7, Pa.

For more details circle No. 87 on enclosed return postal card.

Transistorized Portable Radio

A portable two-way radio with completely transistorized receiver is described in a bulletin covering sensitivity, receive design, audibility, standby drain and field servicing. It also shows the versatility of the new portable in various types of applications in 25-54 mc or 144-174 mc. Bulletin ECR-566-A gives full details. General Electric Communications Products Dept., Syracuse, N. Y.

For more details circle No. 88 on enclosed return postal card.

Hazard Warning Essentials

Recommendations for the selection, use and maintenance of hazard warning portable lanterns, torches and electronic flashers are comprehensively presented in the new Dietz Hazard Warning Manual. Also included are basic requirements necessary to proper hazard warning and recommended hazard warning lighting and urban multiple block detours. Hazard Warning Lighting Div., R. E. Dietz Co., 225 Wilkinson St., Syracuse 1, N. Y.

For more details circle No. 89 on enclosed return postal card.

Traffic Signals

Bulletin No. A-10-3 fully describes the many new features of the Eagle "Big 12" Series "KB-360" Signal, which has resulted in more durable, better constructed units, yielding maximum visibility and light intensity and improved mechanical operation. Eagle Signal Municipal Dept., Moline, Ill.

For more details circle No. 90 on enclosed return postal card.

Safety Wheel Block

How you can avoid the danger of your truck creeping away from the loading dock, or other parking hazards, by the use of a safety wheel block is described in bulletin. Easy to set or remove, the special alloy steel block is said to hold fast on every surface. Calumet Steel Castings Corp., 1636 Summer St., Hammond, Ind.

For more details circle No. 91 on enclosed return postal card.

Turns Street Lights On and Off

Automatic, dependable switching of street lighting circuits when illumination is needed, regardless of time of day, season or weather, is assured with Fisher-Pierce Photoelectric Lighting Control. Literature gives full details. The Fisher-Pierce Co., Inc., 82 Pearl St., Boston 85, Mass.

For more details circle No. 92 on enclosed return postal card.

School Patrol Accessories

Bulletin, two-colors, features School Safety Patrol Raincoats, Belts, Caps, Badges, Patrol Flags, etc. Sizes and prices included. Conney Products Co., Fond du Lac, Wis.

For more details circle No. 93 on enclosed return postal card.

Patrol Car Emergency Breathing Kit

Folder describes and illustrates how the "Emergikit" resuscitator, which is completely self-contained and operated by its own oxygen power, provides automatic resuscitation until arrival of official rescue or ambulance services. F. & J. Mfg. Co., 100 E. Graham Place, Burbank, Calif.

For more details circle No. 94 on enclosed return postal card.

Day-Glo Safety Signs

A colorful brochure describes and illustrates a set of 12 vivid Day-Glo waterproof safety signs, which are designed for insertion into the unit. One is designed for each month and the signs are tied in with National Safety themes and are on waterproof stock. They are printed in two colors, one of which is fluorescent Day-Glo. Waukegan Graphic Arts, 1303 Grand Ave., Waukegan, Ill.

For more details circle No. 95 on enclosed return postal card.

Police Sirens and Lights

A complete line of sirens and lights for police cars, ambulances or any other type of emergency vehicle are described and illustrated in this foldre, available from Federal Sign and Signal Corp., 8755 S. State St., Chicago 19, Ill.

For more details circle No. 96 on enclosed return postal card.

Traffic Engineers and Police Chiefs Give Awards

Outstanding performance in the fields of traffic engineering and police traffic supervision recently brought honors to cities and states over the country.

The Institute of Traffic Engineers recognized 53 cities and 11 states for excellent traffic engineering in 1957. Certificates were based on performance as reported to the Annual Inventory of Traffic Safety Activities, administered by the National Safety Council. Cities must meet or exceed 85 per cent of the Inventory's recommended performance standards and states, 90 per cent.

For achievement in police traffic supervision during 1957, the International Association of Chiefs of Police awarded two states and 53 cities with outstanding achievement awards and seven states and 55 cities with certificates of achievement.

Based on reports to the Annual Inventory, the achievement awards require performance evaluations of 90 per cent or higher for states and 85 per cent for cities; certificates are given on the basis of 85 to 90 per cent for states and 80 to 85 per cent for cities.

Accident Facts Available

The 1958 edition of the National Safety Council's statistical yearbook, *Accident Facts*, is now available.

Accident Facts contains facts and figures on all types of accidents—industrial, traffic, home, farm and school.

More than 30 pages of the 96-page handbook are devoted to motor-vehicle accidents. Included are figures on types and circumstances of fatal accidents, trends in urban and rural death rates and information on contributing factors such as speed, alcohol and age of driver.

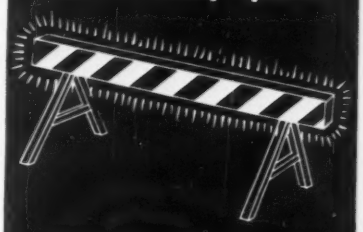
Accident Facts is priced at $1.50 a single copy and less for quantities.

Circle Item No. 13—Reader Service Card

Safety FIRST, LAST and ALWAYS! with

FLEX-O-LITE

Type H Safety Spheres



Mark road hazards for eye-catching reflectivity and brilliance with Type H Safety Spheres at just pennies per square foot. Easy to apply with ordinary traffic paint. Fully effective — long lasting — economical. Write for details.

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8301 Flex-O-Lite Drive
P.O. Box 3066 (Affton Br.), St. Louis 23, Mo.

Parents ~~Want~~, demand A WELL EQUIPPED Safety Patrol

That's where we can help . . .

- Graubard's Equipment is nationally known as the school safety patrol equipment "That Promotes Safety." It does this by fulfilling both of the conditions essential to a really effective Safety Patrol.
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Circle Item No. 15—Reader Service Card

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Board consists of (3) interchangeable sections—14" x 22" each—Enables you to simulate various intersections. Back has replica of 4 lane highway and blackboard surface for special situations.

World-wide acceptance by driver education instructors, insurance adjusters, lawyers, magistrates and safety engineers.

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STOCK SAFETY EMBLEMS

A distinctive Award Button for your Safe Driver or No Accident employee. Available from stock from 1 year through 25 years. 1 or a 1,000. Appropriately enameled.

	58SD	58NA
Gold Plate	$ .95	$ .92
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Gold Filled	1.50	1.45
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SD-3 Two Tone Jewelers Bronze Etching on Genuine Walnut Shield 7¾" x 7¼" $6.50

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Coming events

From Page 7

Oct. 26-31, Mexico City, Mex.

Third World meeting of the International Road Federation (Hotel Del Prado and Secretary of Communications Building).

Oct. 26-31, Miami Beach, Fla.

Sixty-fifth Annual Conference of the International Associations of Chiefs of Police. Leroy E. Wike, IACP Headquarters, Mills Bldg., Washington 6, D. C.

Nov. 5-6, Columbia, S. C.

1958 South Carolina Accident Prevention Conference. Contact B. Fred Derrick, Jr., secretary-treasurer, South Carolina Industrial Commission, P.O. Box 539, Columbia, S. C.

Nov. 11-13, Miami Beach, Fla.

Twenty-eighth Annual Meeting of the Institute of Traffic Engineers (Deauville Hotel). Contact David M. Baldwin, executive secretary, 2029 K. Street, Washington 6, D. C.

Nov. 28, San Francisco

Annual meeting of the American Association of State Highway Officials (Sheraton-Palace Hotel). Contact AASHO, National Press Building, Washington 4, D. C.

Dec. 8-9, New Orleans, La.

Louisiana Safety Association Conference and Exhibit (Roosevelt Hotel). Contact Charles E. Doerler, P. O. Box 1148, Shreveport, La.

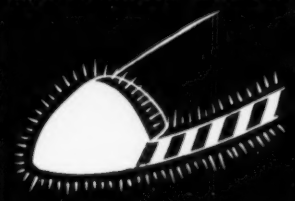
Printed in U.S.A. Stock No. 311.03-098

Circle Item No. 17—Reader Service Card

YOUR Partner IN Safety

FLEX-O-LITE

Type H Safety Spheres



Tops in effective glass bead reflectivity—day or night. Easy to apply with ordinary traffic paint at just pennies per square foot. Full-time protection for utmost safety. Write for details.

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P.O. Box 3066 (Affton Br.), St. Louis 23, Mo.

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NCR BICYCLE REGISTRATION FORMS
No Carbon Required. Either Triplicates with DON'T card or Quadruplicates.
No soiled fingers . . No bother . . No litter.
Bound in booklets for easy filing by number.

CARSTEN PRODUCTS
15406 THOMAS ALLEN PARK, MICH.

Circle Item No. 18—Reader Service Card

Traffic Safety

FORMERLY PUBLIC SAFETY

Vol. 2 No. 3
September 1958

RESEARCH REVIEW

A NATIONAL SAFETY COUNCIL PUBLICATION

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National Safety Council

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Charlottesville, Virginia

The RESEARCH REVIEW is a quarterly supplement published by TRAFFIC SAFETY for the reporting of research that relates to traffic safety. This service is designed to provide those who conduct research, and/or utilize research findings, information that contributes to, advances, or clarifies the body of traffic safety knowledge. The value of research and the prevention of duplication and overlap is enhanced by prompt reporting. To fulfill this purpose, the RESEARCH REVIEW will present completed reports, abstracts, summaries of research in progress, and information regarding contemplated research.

The opinions expressed and conclusions drawn are entirely those of the various authors of these papers. TRAFFIC SAFETY and the National Safety Council accept no responsibility for them, and publication should not be deemed as either endorsement or approval of the ideas expressed or devices described.

Manuscripts appropriate for publication should be submitted to the Research Division of the National Safety Council, 425 North Michigan Ave., Chicago 11. Manscripts cannot be returned unless accompanied by a self-addressed, stamped envelope. Editorial handling will be easier if manuscripts are typed, double-spaced in triplicate, and accompanied by an abstract of 200 words or less and all original art work. Any other information regarding research in progress or contemplated research can be submitted in any form that outlines the full particulars, i.e., investigator, problem, hypotheses, methodology, desired or expected outcomes, etc.

2 **A Comparison of the Driving Records of 1,100 Operators Involved in Fatal Accidents and 1,100 Operators Selected at Random—B. J. Campbell**

Drivers involved in fatal accidents reveal "symptoms" prior to their accidents.

8 **Relationship of Fields of Vision to Safety in Driving—Ralph W. Danielson, M.D.**

Defects in drivers' fields of vision appear to be very minor cause of accidents.

26 **1957 Winter Test Program—Committee on Winter Driving Hazards**

Performance of tires evaluated for traction, braking, and cornering on snow and ice.

32 **Listing of Research Projects**

Current research studies completed and underway.

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A COMPARISON OF THE DRIVING RECORDS OF 1,100 OPERATORS INVOLVED IN FATAL ACCIDENTS and 1,100 OPERATORS SELECTED AT RANDOM

by B. J. Campbell

Acknowledgments

THIS paper reports the results of an investigation undertaken at the request of the North Carolina Department of Motor Vehicles. Thanks are due to the Commissioner and members of the department, particularly Elton R. Peele and Wallace N. Hyde, for their suggestions and for making personnel available to expedite the study. Thanks are also due to Dr. John Kelton and Dr. John Mellinger, both formerly of the University of North Carolina Department of Psychology, for their assistance with respect to some of the problems of statistical theory. Finally, thanks are due to the Institute of Government staff personnel who carried out the extensive computations, particularly Mrs. Frances Campbell who supervised the work, Mrs. Mary Miller, David Mundy, and John Horton.

The author is Research Associate, Institute of Government, University of North Carolina, Chapel Hill, N. C. This article also appeared in *Popular Government*, May, 1958.

Introduction:

WHEN faced with statistics describing traffic deaths in the thousands, it is easy for one to forget that most drivers have neither been involved in a reported accident nor have they been convicted for a moving traffic violation. To disregard this fact may lead to difficulties in interpreting certain kinds of studies. For example, a number of informal, unpublished studies have been conducted which dealt with the prior record of drivers involved in, responsible for, or contributing to fatal accidents. In most of the studies, it was reported that only a fraction of the drivers had records showing accidents and/or violations prior to the fatal accident. It would be easy to interpret such results as meaning that drivers who become involved in fatal accidents are no worse than the average driver.

The results of these studies would appear in a much different light, however, if a comparison group of typical drivers had been included. It may be true that only a small part of the drivers involved in fatal accidents had any prior record, but this "small" per cent is more meaningful when compared with the even smaller percentage of randomly selected drivers with a prior record.

Purpose:

The purpose of this study is to compare drivers involved in fatal accidents with drivers selected at random. The comparison is made with respect to information recorded at the time the driver was licensed and with respect to the accident and violation record the driver built up in the years following licensing. The reason for using these measures becomes obvious upon reviewing an implicit assumption of driver licensing programs. It is assumed that the tendency to have accidents is often heralded by deficiencies in driving skill and by failure to obey the motor vehicle laws. Thus, on the assumption that deficiencies in driving skill indicate a tendency to have accidents, driver license examinations are required in order to screen out applicants whose driving does not meet the standards. On the further assumption that drivers who violate the law are likely to cause (or be involved in) accidents, driver improvement programs take action toward the persistent violator.

If the preceding assumptions are valid, it would be predicted that drivers who become involved in fatal accidents (as a group) would have indicated this tendency by: (1) poorer than average performance on the license examinations; and (2) more than the average number of violations of the motor vehicle laws. The "average" against which the drivers involved in fatal accidents are compared is a group of drivers selected at random. This study is designed to test the two hypotheses stated above.

Defining and Selecting the Samples

Two sample groups were employed in this study.

1. The Accident Group consists of 1109 North Carolina licensed drivers who were involved in fatal accidents in the state during 1955.

2. The Random Group consists of 1109 North Carolina licensed drivers selected at random from the Master Driver File in Raleigh, North Carolina.

The Accident Group includes most of the drivers involved in fatal accidents in North Carolina in 1955. Missing are approximately 200 drivers whose records were unavailable (out-of-state drivers, unlicensed drivers, etc.). The Random Group was selected by drawing one case from each of some 1,100 file drawers in which driver records are filed alphabetically. The file clerks were instructed to select the cases from various parts of the drawers. There are no chauffeur license holders in either group.

This study used "involvement" in a fatal accident as the criterion for membership in the Accident Group. By virtue of using this criterion rather than a more rigid one such as "responsible for" or "contributing to" the fatal accident, it is likely that some "good" drivers are in the Accident Group. No doubt the groups would have been more distinctly different if a more rigid selection procedure had been used for membership in the Accident Group; however, availability of records dictated the present criterion, and since the results were significant in many respects, it can be assumed that a more rigidly selected sample would have yielded even more significant results.

Information on Which the Groups Were Compared

The two groups were compared on the following items of information:

Personal Data

age	sex
color of hair	color of eyes
race	car make

Road Test Maneuvers

quick stop	second start
backing	first approach to corner
hand brake stop	second approach to corner
turn about	first slow sign
parallel parking	second slow sign
stop on grade	first stop sign
start on grade	second stop sign
shift on grade	first traffic signal
posture	second traffic signal
clutch	first left turn
attention	second left turn
distraction	third left turn
keeping in lane	first left turn signal
following	second left turn signal
overtaking	third left turn signal
right of way	first right turn
use of horn	second right turn
first start	first right turn signal

Total Scores

road signs test	road rules test
road driving test	

Driving Record

number of prior accidents* number of prior violations*

The information analyzed in this study was obtained from each driver's master folder which contains his entire record. Personal data were obtained from the driver at the time of licensing. During the road test, the applicant's performance on each maneuver was rated on a three point scale. The test scores are recorded in the driver's folder, as are notations pertaining to his accident and violation (conviction) record.

Results

Although the two groups were compared on the basis of all the measures listed previously, only the measures which are statistically significant will be reported. Table I contains the results of the measures which showed significant differences between the Accident Group and the Random Group. Some comments regarding the appropriateness of the statistical tests are noted in Appendix I.

The immediately outstanding feature of the results is that only seven measures out of 47 showed significant

*See Appendix III

differences between groups. This is a small proportion and might be interpreted as meaning that the Accident Group was not different from the Random Group. There are, however, several significant findings that should be considered.

Basically, the results show that there are measures on which the Accident Group and the Random Group score differently. The Accident Group had a lower average score on the road test than did the Random Group. The driving record of the Accident Group was significantly worse (even before the fatal accident) than the Random Group. The two groups do not, however, differ significantly on most of the individual road test maneuvers. The important findings are reported in more detail in the following passages.

1. It was found that drivers in the Accident Group averaged almost two years younger than drivers in the Random Group. This difference approaches statistical significance, and is consistent with previous findings which state that younger drivers are involved in more than their share of accidents.

2. The comparison of color of hair was included as a check because there is no reason to assume that color of hair is related to accidents. It would, therefore, be predicted that the various colors of hair would appear in the same proportion in both groups. This was found to be true. Such information could be valuable in giving an indication of an inadequacy in the sample. If differences occurred when there was no reason to expect their occurrence, one might be suspicious that the sample was defective. Since no such differences occurred, there is no evidence that the samples are biased.

3. There were significantly fewer females in the Accident Group than in the Random Group. This is consistent with previous findings showing that women have proportionately fewer accidents than men.

4. The percentage of each race in the Accident and Random Groups was measured. There were no significant differences according to race. The incidence of drivers of various racial origins was virtually the same in the Random Group as in the Accident Group.

5. In most of the individual road test maneuvers, the two groups did not differ significantly in the average rating they received. There are, however, a few important exceptions. In the case of parallel parking, the Accident Group was rated lower than the Random Group. The difference was not large, but it approached statistical significance. Moreover, it was found that the drivers in the Accident Group were rated significantly lower on the left turn signal the second and the third time the maneuver was given. There were no significant differences on the first left turn signal or on right turn signals.

6. The Accident Group was rated significantly lower than the Random Group on the total score of the road

Table I

Measures Showing Significant Differences Between Groups

Measure	df & N*	test used	c. r. or X^2	p	Explanation
Age	Na=1095 Nr=1107	c. r.	1.91	.06	accident group younger than random group
Sex	df=1 N=2201	X^2	126.9	.001	females less frequent in accident group than in random group
Parallel parking	Na=579 Nr=640	c. r.	1.87	.06	accident group rated lower than random group
Signal on second left turn	Na=623 Nr=693	c. r.	2.17	.03	accident group rated lower than random group
Signal on third left turn	Na=553 Nr=615	c. r.	2.82	.01	accident group rated lower than random group
Road test score	Na=831 Nr=909	c. r.	2.28	.03	accident group performed more poorly than random group
No. Violations**	df=7 Na=1109 Nr=1109	X^2	48.0	.001	accident group had more violations (prior to fatal accident) than random group

*Na=Size of Fatal Accident Group

Nr=Size of Random Group

**See Appendix IV

test. The difference was not large (only about one point), but it was reliable and significant.

7. In the Accident Group, the number of violations prior to the fatal accident was compared with the number of violations in the Random Group. The Accident Group showed 50 per cent more violations than the Random Group.

8. The prior accident record of the Accident Group was not significantly worse than the accident record of the Random Group when the accident distributions were compared by Chi Squared. However, the proportion of drivers in the Accident Group with no prior accidents was significantly lower than the corresponding proportion in the Random Group. Also, the number of accidents per driver was significantly higher in the Accident Group (prior to the fatal accident) than in the Random Group.

Discussion

The results of this study give cause for both satisfaction and concern. A certain amount of satisfaction is justified because the study is consistent with the belief that the traditional approaches to driver licensing and driver improvement are valid. At the same time, there is cause for considerable concern since the study indicates that the methods used in these programs are probably realizing only a fraction of their potential.

The reason that satisfaction is justified is that the study shows some clear-cut differences between the two groups. The Accident Group had a much worse violation record than the Random Group. Also, the total road test performance of the Accident Group was significantly poorer than that of the Random Group. The importance of these findings is underscored by the fact that the differences are based on information gathered before the fatal accident happened. This indicates that "symptoms" of a future accident were shown before the accident occurred. Through the refinement and expansion of license examinations, the detection of potentially dangerous drivers can be made more efficient. This will enable state motor vehicle agencies to be more effective in taking action toward drivers who are likely to become involved in serious accidents.

The cause for concern about the programs is seen when the differences between groups are examined further. Although the Accident Group scored consistently lower than the Random Group on the road test, the extent of their poorer performance averaged only one point. Of course, a difference of one point is so small that a driver license examiner could not predict in advance whether a particular applicant would end up as a typical driver or would end up involved in a fatal accident. The existence of the difference indicates that the road test has validity, but the size of the difference is so small as to be of little practical value. Development of the test can, however, increase the size of the difference to a point that the test will have very much practical value.

The smallness of some of the differences found in this study has a number of causes, and these causes bear brief treatment. Taking the total road test score as an example, the first cause of small differences between the groups is the relatively low reliability of the test. A second factor is the restricted range of scores. All of the scores were in the passing category (since the study dealt with licensed drivers), and the average number of points deducted was only five for the Random Group and six for the Accident Group. Small point deductions are common for applicants who pass because most failures of the road test are the result of single, hazardous or illegal acts. Relatively few drivers receive a low score as result of a repetition of moderately unskilled acts.

The differences between groups with respect to previous violations (convictions) indicate that those in the Accident Group did not drive as well as the average driver (typified by the Random Group) even before the occurrence of the fatal accident. Such results are consistent with the policy of aiming state driver improvement and enforcement programs at the persistent violator.

The differences between groups with respect to certain road test maneuvers indicate that those in the Accident Group were inferior to the typical driver in certain driving practices. The parallel parking maneuver showed a difference that approached statistical significance. It is possible that this maneuver is useful because it tests the applicant's performance in coordinating steering, braking, shifting, use of the clutch, and judgment of small distances.

The next finding is that the Accident Group was rated significantly lower on giving left turn signals. This outcome raises some interesting speculation. Ordinarily on a road test, the applicant is required to make at least three left turns. At each of these he is, of course, expected to give a hand signal. The rating of the two groups is almost identical for the first signal, but the Random Group showed improvement on the next two signals, whereas the Accident Group became worse. As a result, the Random Group is significantly better on the latter two measures. The results might be interpreted as showing that the Accident Group was careful to signal at first, but became more careless about it as the test progressed. It must be pointed out, however, that such differences did not appear on right turn signals.

Most of the individual maneuvers on the test did not show any significant differences between groups. Nevertheless, the test as a whole (the sum of the individual maneuvers) *did* show significant differences. Thus, some maneuvers, non-significant by themselves, must have contributed to the overall significance of the road test.

Limitations of the Study

This study must, of course, be interpreted in the light of its limitations. Some of the obvious limitations are listed as follows:

1. This study was carried out on groups selected "after the fact," in that the groups were selected after the fatal accidents occurred. Eventually, research in this field will have to include carefully controlled, systematic experimentation. Such experimentation will be considerably more expensive than the present type of study which was carried out on a negligible budget. While "after the fact" research may be valuable, it is no substitute for more elaborately controlled experimentation.

2. The samples in this study are relatively small. Despite the fact that more than 1,000 drivers were included

in each group, the combined samples constituted only about one-tenth of 1 per cent of the licensed drivers in North Carolina. When major research projects are undertaken, samples numbering in the tens of thousands should not seem unreasonable. This is particularly true in the case of research concerning accidents because of the low occurrence rate of accidents within the sample and because of the extreme heterogeneity of the population from which the sample is drawn.

3. The third limitation is one which seems to be inherent in studies of this sort. The study is limited to licensed drivers. The least skillful drivers are not included in the study because they are not licensed. In conducting research, it is desirable to select widely differing groups and compare their performances. It appears, however, that driver license research must be carried out without the research advantage of the "bad" group.

Conclusions

This study has shown that in some significant respects the 1,109 North Carolina drivers involved in fatal accidents in 1955 differed from the 1,109 North Carolina drivers selected at random as a control group.

1. Drivers involved in fatal accidents had worse than average driving records prior to their fatal accidents.

2. Drivers involved in fatal accidents performed somewhat worse than average in some phases of the original licensing procedure.

3. The data suggest rejection of the idea that drivers who become involved in fatal accidents are typical drivers who show no advance "symptoms" of the kind of driving that might eventuate in a fatal accident.

Recommendations

When a driver becomes involved in a serious accident (or even a less serious one), he is in a sense an example of an "error" in the driver licensing process. The fallibility of driver licensing and driver improvement procedures is demonstrated when a potentially dangerous driver is licensed and then causes an accident. It must be conceded that driver licensing cannot become infallible; however, in coming years the scope of driver licensing is likely to grow tremendously. It is not unreasonable to suppose that such important but untapped variables as "attitude" and "personality" will some day be dealt with in driver licensing. Methods are available now which can lead to the refinement of driver licensing procedures to the point that "symptoms" of dangerous driving which now go unnoticed could be used as a basis for issuance and withdrawal of the driver license.

If driver licensing is to develop properly, a great deal of research will have to be carried out. The following passages suggest the need for two such programs of research.

1. Driver license examinations need to be evaluated in terms of their ability to predict unsafe drivers in advance. In order to accomplish this, it will be necessary to collect and retain detailed information relative to the driver's performance on various phases of the original examinations.

After some years have elapsed and a large number of drivers have had time to amass good or bad records, psychometric methods (including an item analysis) can be used to construct tests based on subsequent driving experience. This procedure could be applied to the written test, road test, signs test and the test of vision.

2. Driver improvement programs need to be evaluated in terms of their effectiveness in controlling and improving drivers. Such a study should inquire into the effectiveness of suspension, probation, warning letters and publicity campaigns in improving drivers. Research should be carried out to find the correlation between accidents and various kinds of violations (in which no accident was involved). Such a study would complement the information already available pertaining to the types of violations charged in accidents and might suggest that some violations are better "predictors" of accidents than others.

Each of the above two topics represents a whole series of studies. To be carried out properly, each step would have to be carefully administered. Control groups would have to be set up, statistical analyses would have to be planned, and the influence of disturbing variables would have to be removed. Obviously, no single motor vehicle department can undertake research of this scope at present. In time, however, these problems must be undertaken if driver licensing is to progress. No doubt, coordinating agencies can aid immeasurably in meeting these challenges in the next few years.

Appendix I

The critical ratio was frequently used in this study, and in view of the peculiarities of the sample distributions, a few comments seem advisable. In most cases involving the critical ratio, the test was being made between the average rating received by the two groups. The rating was made on a three point scale. Suppose that the two distributions were as follows:

Accident Group		Random Group	
Rating	Frequency	Rating	Frequency
3 (good)	565	3 (good)	620
2 (fair)	75	2 (fair)	95
1 (poor)	15	1 (poor)	10
	N=655		N=725
	X=2.840		X=2.841

The average for the two groups is based on extremely skewed data. The standard deviation is quite small since most of the cases lie very close to the mean. It appears nevertheless that the assumptions of the critical ratio can be met reasonably well, and since the critical ratio is a more powerful test than Chi Squared, it has been used where possible.

It will be recalled that the assumptions of the critical ratio are:

1. the distribution of sample means is normal
2. the sample standard deviation is an unbiased estimate of the population value
3. the sample is random

It is felt that the first assumption can be met due to the operation of the Central Limit Theorem. This theorem is true when the sample is large. Large sample size also results in meeting the second assumption, and it is felt that the sample is random.

A more serious consideration is the fact that the critical ratio implicitly assumes the existence of data arrayed on

an interval scale. There is no reason to assume that the rating scale used in this study is more than an ordinal scale.

Appendix II

Measure		N	df	$\bar{X}_a$	$\bar{X}_r$	CR	X^2	p[1]
Age	A	1095		33.2	34.8	1.91		.06
	R	1107						
Color of Hair		2218	15				.96	
Sex		2201	1				126.9	<.001
Race		2154	1				.58	
Color of Eyes		2211	9				.20	
Car Make		2209	66				.69	
Maneuvers:	A	626		2.915	2.919	.02		
Quick Stop	R	692						
Backing	A	658		2.678	2.676	—.06[2]		
	R	738						
Hand Brake Stop	A	450		2.827	2.850	.08		
	R	532						
Turn About	A	577		2.750	2.734	—.06		
	R	651						
Parallel Parking	R	579		2.532	2.592	1.87		.06
	R	640						
Stop on Grade	A	524		2.867	2.875	.06		
	R	624						
Start on Grade	A	516		2.867	2.875	.00		
	R	631						
Shift on Grade	A	389		2.936	2.949	.07		
	R	451						
Posture	A	610		2.880	2.903	1.24		
	R	692						
Clutch	A	605		2.705	2.739	1.21		
	R	713						
Attention	A	588		1.895	2.914	1.02		
	R	683						
Distraction	A	508		2.955	2.953	—.00		
	R	615						
Keeping in Lane	A	581		2.835	2.828	—.03		
	R	676						
Following	A	451		2.949	2.966	1.25		
	R	529						
Overtaking	A	404		2.970	2.990	1.46		
	R	529						
Right of Way	A	493		2.939	2.935	—.02		
	R	585						
Use of Horn	A	463		2.944	2.944	.00		
	R	553						
First Start	A	654		2.798	2.811	.05		
	R	742						
Second Start	A	536		2.937	2.934	—.01		
	R	608						
1st Approach to Corner	A	637		2.827	2.819	—.03		
	R	725						
2nd Approach to Corner	A	562		2.881	2.870	—.05		
	R	646						
First Slow Sign	A	503		2.918	2.921	.01		
	R	604						
Second Slow Sign	A	464		2.950	2.946	—.02		
	R	541						
First Stop Sign	A	626		2.853	2.871	.08		
	R	711						
Second Stop Sign	A	550		2.938	2.900	—.99		
	R	610						
First Traffic Signal	A	516		2.930	2.926	—.23		
	9	595						
Second Traffic Signal	A	453		2.949	2.932	—.04		
	R	529						
First Left Turn	A	664		2.785	2.760	—.00		
	R	753						
Second Left Turn	A	642		2.801	2.807	.25		
	R	721						
Third Left Turn	A	564		2.828	2.804	—.86		
	R	638						
1st Left Turn Signal	A	644		2.826	2.839	.02		
	R	728						
2nd Left Turn Signal	A	623		2.796	2.853	2.17		.03
	R	693						
3rd Left Turn Signal	A	553		2.807	2.881	2.82		.01
	R	615						
First Right Turn	A	651		2.853	2.821	—1.33		
	R	731						
Second Right Turn	A	610		2.874	2.840	—1.42		
	R	695						
1st Right Turn Signal	A	636		2.836	2.823	—.52		
	R	716						
Road Signs (Points Missed)	A	927		5.563	5.155[3]	1.11		
	R	1020						
Road Rules (Points Missed)	A	1013		12.213	12.778	—1.36		
	R	1041						
Road Test (Points Missed)	A	831		10.363	9.528	2.28		.02
	R	909						
No. Violations		2218	7				48.0	
No. Accidents		2218	3				5.5	.20>p>.10[4]

[1]values for a two tailed test

[2]a negative critical ratio indicates the difference was opposite to the predicted direction

[3]the accident group is predicted to be higher in the tests (i.e., have more points deleted)

[4]though the X^2 is not significant when applied to the differences between the accident distributions of the two groups, the Random Group has significantly fewer accidents per person and significantly more drivers with *no* accidents (using CR of the difference between independent proportions)

Appendix III

Since the study is concerned with the performance of the Fatal Accident Group prior to the fatal accident, it is necessary to consider only the part of the record compiled before that accident. The original data contained the complete record of the drivers, including the fatal accident. A numerical correction was applied to the group data so that only pre-fatal accident data would be included.

The original data showed that all members of the Accident Group had been in at least one accident. The data showed 833 drivers with one accident, 212 with two, 48 with three, etc. In the case of the 833 drivers with one accident, the accident had to be the fatal accident. Therefore, they had to have a clear record with respect to accidents before their fatal accident. The 212 drivers with two accidents had the fatal accident and one other. Each driver in the Accident Group was listed as having one less accident than his record showed, thus subtracting out the 1,109 fatal accident. Administrative errors such as failing to record an accident would, of course, disturb the accuracy. However, the errors alter the results in the direction of conservatism and ideal data would prove to be even more significant.

The correction for violations was slightly more complicated. Not everyone involved in a fatal accident is convicted for a violation. On the basis of prior evidence, it seems a fair guess that not more than half the drivers involved in fatal accidents are convicted for a violation arising out of the accident. Half of the drivers with one conviction were listed as having received the conviction as a result of the accident (these drivers were then listed as having no prior convictions). Half the drivers with two convictions were assumed to have only one violation before the accident. This correction was applied throughout the range of violations.

RELATIONSHIP OF FIELDS OF VISION TO SAFETY IN DRIVING*

With a Report of 680 Drivers Examined by Various Screening Methods

by Ralph W. Danielson, M.D.

Introduction

EARLY in my practice, I was astounded when a patient with 20/200 vision in each eye stated that he drove a car as fast as anyone else, and yet had never had an accident. Since then, through the years, many requests have been sent in from the Driver's Examination Department asking whether the driver should be granted a license. It has been our custom to be lenient with examinees who have near normal confrontation fields and fundi, despite the lack of good visual acuity. As far as we know, no such individual has been involved in a serious accident.

For years, I have been making the statement that I would rather meet a driver on the highway with poor visual acuity and a good field, than a person with good visual acuity and a constricted field. Now I am wondering just how important it is to have a full field.

A colleague, in a recent discussion of this subject, suggested that pertinent information be collected. On delving into the literature, I found no comprehensive study. I therefore decided to make this somewhat of a pilot paper, indicating many facets of the problem, any one of which could be pursued later in more detailed fashion.

This essay, therefore, will attempt to throw some light on the following general questions:

1. Are field defects compatible with safe driving? If so, what types are safe?

2. How often is a field defect the primary cause of an accident?

3. How wide should peripheral fields be to justify a driver's license?

This paper may fittingly begin by stressing the extreme difficulty of evaluating any one particular factor as the cause of accidents when there are so many tangible, intangible, and variable factors that may enter into an accident (1, 2c, 3, 4, 5). An example of trying to control factors in an analysis is given by Emond (8). Chapman (7) recommends an epidemiologic study approach.

There have been many opinions offered by various authors, and in pamphlets obtainable from the instrument manufacturing companies, as to whether or not poor visual ability has any marked relationship to driving safety or to accidents (2, 9, 10, 11, 12, 13). The conclusion of Wilson (14) in an analysis of 10,000 employees in an industrial plant seems to sum up the majority opinion as to drivers also. "This survey indicates that there is little or no connection between unsatisfactory vision and accident proneness. It does confirm that the older, more experienced employee is the safest. . . . Younger people have more accidents."

Accidents and the Driver's Bureau Questionnaire

In order to get the views of the administrators of the drivers licensing bureaus of the various states, a rather extensive questionnaire was sent out.[1]

Among the interesting results from this questionnaire were the following. Forty-eight were mailed, 33 were returned. A three-to-one majority said there was little, if any, proof that visual defects had any definite relationship to accidents. When asked "Does the driver's knowledge of any handicap make him compensate sufficiently to overcome it?" 16 said "yes" and 8 said "no." Kerrick, of Oregon, said, "Individual ability and willingness to compensate represent the 'unknown factor' in the whole field of drivers' vision." Sixteen answered that their experience with handicapped people had been good, and one said it was poor. The most interesting feature was in answer to the question as to whether any case was known where defective fields had been the major cause of an accident. Two said "yes" and 16 said "no." The remainder made no comment.

* Prepared in cooperation with the University of Colorado School of Medicine and the Driver's Licensing Section of the Motor Vehicle Division of the State of Colorado.

[1] Anyone wishing to peruse the questionnaires or other data reported in this paper may obtain them from the author or from the library of the State Highway Department, 4201 E. Arkansas Avenue, Denver, Colorado.

A brief statement concerning fatal accidents in 1954 as reported by the National Safety Council (15) and the Travelers Insurance Company (16) may give us further orientation. Ninety thousand people died in the United States in 1954 by accidents; of these deaths 36,000 were caused by motor vehicles. Sherman (17) says that the total number of deaths in all industries was 14,000, but oddly, the number of persons killed going to and from work was much greater than that. The number of auto accidents in 1954 was 1,250,000. The total number of people killed each year by automobiles has constantly risen, but the death rate per population, per miles driven, and per number of cars driven has gradually declined. The death rate from motor vehicle accidents for various countries for 1952 per 100,000 vehicles was 7.2 for the United States, the lowest of all countries except New Zealand, which had a rate of 6.4. The rate in other countries was considerably higher, rising as high as 91.6 in the Dominican Republic.

What are the main factors in these deaths and accidents? It has been estimated by many authorities (18) that 80 per cent of all automobile accidents are due to driver failure, and 20 per cent to all other causes. It has further been estimated by Cleeton (18) that of the driver failure cases, 74 per cent is in the category of faulty attitude, judgment, attention, and concentration; 12 per cent is caused by physical disability, including poor vision; and 12 per cent is due to lack of knowledge and operating skill.

Much has been written with regard to the all-important factor of driver attitude, especially as to interviews before and after accidents by Forbes (19), Tillman and Hobbs (20), Quinan (21), Johnstone (22), Brandaleone (23), Brody (3, 5), Lauer (25), and Sherman (17). Brody introduces the term "comprehensive seeing." Halsey (26) says: "It is not the picture which the eye presents to the driver which counts, but what the picture means to him."

In the summary of motor vehicle accidents for 1954 for Colorado (27), it is estimated that in 3 per cent of accidents there were driver defects present. Of 56,677 drivers in accidents, the following conditions were present as reported by the investigators: defective eyesight, 173; defective hearing, 48; other bodily defect, 93; illness, 123; fatigue, 189; and, apparently, sleep, 724. Thus, we can see that defective vision may have been a factor in only 0.3 per cent of 1954 Colorado automobile accidents.

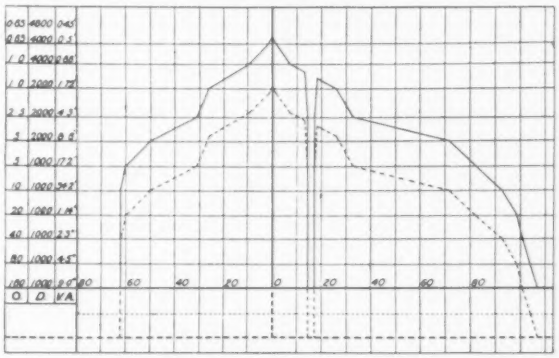
If we apply the 0.3 per cent factor to the 36,000 national auto deaths in 1954, we can estimate that there were 108 deaths in which "poor eyesight" may have been a contributing factor. One may only conjecture as to what percentage of this number was primarily field defects as compared to lowered visual acuity and muscle abnormalities.

Theoretic Discussion of Fields

Fields of vision instead of *field* of vision was employed in the title of this paper to accentuate the fact that there are various fields of vision. There is the *ordinary, customary, and normal* field taken with the eye in the primary position, which is composed of the *macular, central, and peripheral* fields. The familiar drawing from Traquair (28) (Figure 1) shows the "hill" of increased visual acuity in the central field as standing out from the peripheral field. The familiar isopter concept has been stated in another way by Fletcher (2e), who quotes Luckeish as saying "the visual acuity drops off 80% at a distance of 2.9° from the fovea, 90% at 5.8°, 95% at 12°, and 99% at 30°."

Traquair (28) says "the ordinary field is often called the *relative* field, in contrast to the *absolute* or *maximum* field, which is obtained when the eye is fixed and the face turned during the examination of each meridian in such a way as to exclude the influence of the orbital margins. . . . It does not extend to more than about seventy degrees in any direction upwards or inwards." I believe the maximum field can be measured, however, by turning the eye in the opposite direction and measuring the distance on the perimeter from the primary position of the eye (not the target on the perimeter).

Figure 1. Horizontal Section of Field of Vision (from Traquair)



O. is the diameter of the test object in millimeters, D. its distance from the eye in millimeters, and V.A. the visual angle subtended at the nodal point.

Table I. Practical Uniocular Field of Vision, with Reference to the Primary Position of the Driver

Static (relative or normal) field to same side as turning	Position of eyes, head, and body: *Eyes move also*	*Total field with moving eyes*	*Head moves also*	*Total field (static + eye and head movement)*	*Body moves also*	*Total field (static + eye, head, and body movements)*
		TEMPORALLY				
100 (Traquair)	50	110°[a, b]	60	170	40	210
		NASALLY				
60 (Traquair)	50	60°	60	120	40	160
		SUPERIORLY				
60 (Traquair)	40	60°	45	105	30	135
		INFERIORLY				
75 (Traquair)	50	75°	45	120	30	150

[a] Limited by orbital margin.

[b] Only on the temporal side does the eye movement add to the practical field.

Offhand, it would seem that we increase our normal field markedly by moving our eyes, but actually there is only a slight increase of about 10° on the temporal side when the eye is moved in that direction, apparently because the temporal field is normally restricted by the dioptrics of the eye rather than by the orbital margin (Table 2).

Table 2. Variation of Total Uniocular Field in Eccentric Positions

Non-Primary or Eccentric Position						Primary Position			Non-Primary or Eccentric Position					
50° *Temporally (limit of rotation)*			*10° Temporally*			Eyes Straight Ahead			*10° Nasally*			*50° Nasally*		
T	*N*	*Total*	*T*	*N*	*Total*	*T*	*N*	*Total*	*T*	*N*	*Total*	*T*	*N*	*Total*
60	70	130	100	70°	170	100	60	160	100	50	150	100	10	110
110	20	130	110	60	170				90	60	150	50	60	110

° Maximum field.

Thus, with relationship to the "primary position of the driver and car," the temporal field is 110° if the eye is moved while, with reference to the optic axis of the eye, the field is still 100°. We may speak of the primary position of a driver as straight ahead of his position in the car, just as one speaks of the primary position of the eyes as straight ahead. Thus, if we move the eye 40° more to the limit of rotation, the driver's temporal field remains at 110°, because 40° of the nasal field is borrowed to make up the difference. However, in this position the temporal "eye field" is only 60° (100—40). On the nasal side the eye field begins to be cut as soon as the eye is turned nasally.

Referring then to Tables 1, 2, and 3, which take into account the temporal movement increase and the maximum field on the nasal side, one can see that the total eye field of one eye is the greatest when the eye is turned 10° temporally and the least when turned to the limit on either side, especially nasally. The apparently logical recommendation that has been made that a one-eyed driver should thus turn his head slightly to the other side would need to be considered, however, in relationship to the question, "Which side of the field is the more important for a one-eyed driver?"

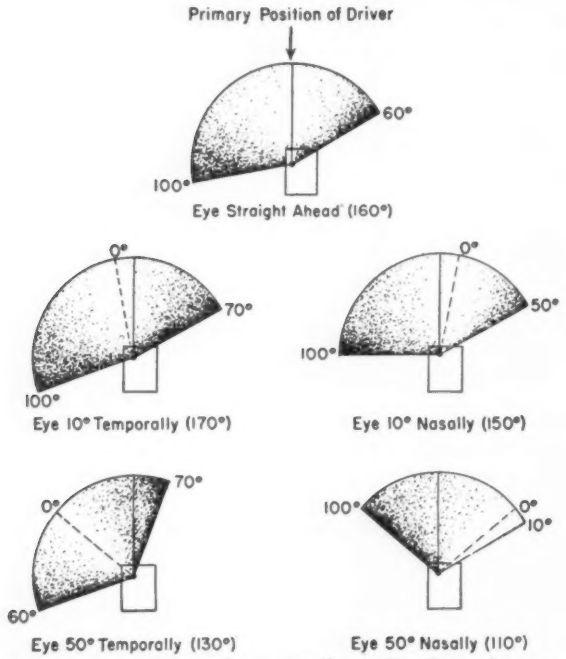
The variation in the *binocular* "eye field" is just as striking, for the temporal field of the left eye looking temporally is 60°, and the temporal field of the right eye looking nasally is 100°, making a total of 160° as compared to the 200° in the primary position (Table 2 and Figure 2).

Why then do we get the sensation of increasing our peripheral field by turning our eyes to the side, when really the fields are less? Apparently it is an illusion because of the relative clarity of the macula and central field which is substituted thereby for the less clear vision of the peripheral field.

As a related idea, it seems that we should consider the concept that perhaps it is more important to see well in the central field than to have side peripheral fields. There is an analogy in the fact that in deciding whether to correct a deviating eye, due to a paretic muscle, surgically, we pay more attention to how the eyes coordinate in the primary field of fixation than at the limits of rotation of the eyes.

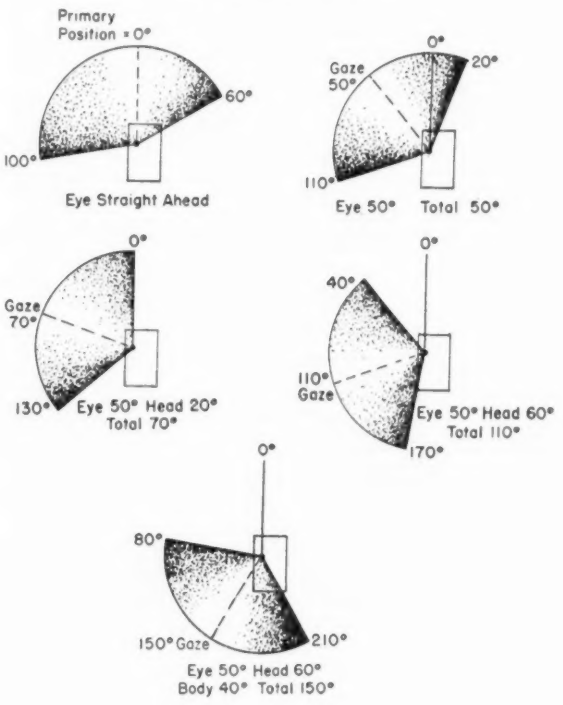
In any revision of the excellent set of standards for visual efficiency rating as given by the American Medical Association Committee (29), perhaps giving additional weight to each ten degrees of field as one approaches the center should be considered.

Figure 2. Variation in Field with Changing Gaze (To illustrate Table 2)



The measurements given are from the line of gaze (0°), when the eyes are turned from their primary position.

Figure 3. Practical Fields of Vision (To illustrate Table 3)



De Rötth (30) speaks of the practical fields of fixation, meaning the excursion of the eyes plus the turning of the head and body. It would seem only logical, therefore, to go a step further to coin the term *practical* fields of vision to mean the normal, static field increased by the movement of the eyes, head, and body. It is a well-known fact that, because of fatigue, one seldom keeps one's eyes turned farther than 30° without also turning the head.

In concentrating on how our peripheral field is increased in the direction the eyes, head, and body are moved, we should not lose sight of what happens to the other edge of the field, particularly in one-eyed drivers. Thus, by referring to Tables 3 and 4 and Figure 3, we see that when the driver with only a left eye is in the primary position in the car, he sees 100° to the left and 60° to the right. However, if the eye is turned 50° temporally, the nasal border of the field is only 20° to the right of straight ahead. If, in addition, there is a 60° turn of the head and a 40° turn of the body (as in changing lanes), the nasal (right) border will be 80° to the left of straight ahead. In turning an eye nasally, one gets a similar interesting situation, but to a lesser degree.

Table 3. Location of Practical Peripheral Fields of Vision of Left Eye in Various Positions Temporally

Static and normal field temporally	*Static and maximum field nasally*	*Position of eyes, head, and body*	*Total turn*	*Sees to left (temporally)*	*Position of nasal limit of field*
100	60	All straight ahead on road	None	100	60° to right of straight ahead
100	70[a]	Turn eyes 50° temporally	50	110[b]	20° to right of straight ahead
100	70[a]	Turn head 20° temporally	70	130	Straight ahead
100	70[a]	Turn head 60° temporally	110	170	40° to left of straight ahead
100	70[a]	Turn body 40° temporally	150	210[c]	80° to left of straight ahead

[a] On the nasal side the maximum field is 10° greater than the normal field, i.e., 70° (Traquair).

[b] Limited by orbital margin.

[c] 30° over to right, i.e., beyond straight back of driver.

By referring to Tables 1, 2, and 3, one can calculate the practical binocular field of vision by adding the practical temporal fields of the two eyes. In a normal individual, therefore, it is 420° (210° plus 210°) which means that it is more than a complete circle.

The efficiency of the practical field is, of course, enhanced by the use of mirrors, which might be discussed in much detail. Suffice it to say that the ideal position for a mirror, from the viewpoint of moving one's eyes as little as possible off the road, is on the fenders, but from the viewpoint of largeness of field, the mirrors should be as close as practicable to the eye. One of the special mirrors that have been invented has a battery of five mirrors at five angles. It stretches across the top of the entire width of the windshield, and with it the driver, by moving his eyes only, can watch a person walk entirely around his car.

Table 4. Location of Practical Peripheral Fields of Vision of Left Eye in Various Positions Nasally

Static and normal[a] field nasally	*Static and maximum field temporally*	*Position of eyes, head, and body*	*Total turn*	*Sees to right (nasally)*	*Position of temporal limit of field*
60	100+	All straight ahead on road	None	60	100° to left of straight ahead
60	100+	Turn eyes nasally 50°	50	60[b]	50° to left of straight ahead
60	100+	Turn head nasally 50°	100	110	Straight ahead
60	100+	Turn head nasally 60°	110	120	10° to right of straight ahead
60	100+	Turn body to right 40°	150	160	50° to right of straight ahead

[a] On the temporal side the normal or relative field is practically the same as the maximum or absolute field (Traquair).

[b] Limited by orbital margin.

The practical fields of vision, then, for a driver are further modified by the car and by the environment. It is obvious, when one considers it, that one's field in a car is a narrow horizontal strip which varies largely in the horizontal plane with the motility of the eyes, head, and body, and in the vertical plane by the position of the driver's head in relation to the windshield and windows. This has been excellently discussed by Heath and Finch (32).

Standards and the American Optical Company Reports

A few words about existing standards as to field of vision are in order. Attention should be called to the comprehensive survey (33) published yearly by the American Optical Company on the state requirements for motor vehicle operators. It is there reported that nine states (Connecticut, Delaware, Maryland, Massachusetts, Mississippi, Missouri, New Hampshire, Oregon, and Vermont) have visual field testing requirements. However, my own survey of administrators (referred to above) indicates that eight more states do field examinations on certain special cases. Burnett, who supervises the preparation of the American Optical Company reports, says it is his impression that the so-called "requirements" are usually only screening tests to refer drivers for more complete examination. All the states except one (Colorado) examine in the horizontal meridian only and usually only temporally. The Administrator's Manual (34) says that a temporal limit of 55° to 60° is a definite handicap.

The American Medical Association Committee (35, 36) set standards on visual requirements, including fields, in 1937. They recommended a form field in the horizontal of not less than 45° to both sides laterally from the point of fixation. Field standards have also been suggested by Lebensohn (37), Weymann (38), Luedde (39), Berens (40), and Selling (41). Brandaleone (105) gives an excellent list of general physical qualifications for a driver.

The American Optical survey reports a variation in standards for total field from 90° in Vermont to 150° in Mississippi. The military ruling (42) is that contraction of 15° in any meridian disqualifies, but Schwichtenberg

(43, 44), believes the binocular vision field standard for military men should be 30° less than at present.

The International rules are given (45) as 70° for a 3° object. The Interstate Commerce Commission has set a binocular minimum of 140° (39). The Russian requirements (46, 47), state that any restriction in field rules out chauffeurs.

Discussion of Graphs & Tables, and Relation to Personal Road Experience

In order to reveal some objective evidence on the question as to the advisable field width for safe driving, the writer has devised some self-explanatory reference tables (1, 2, 3, 4, 5, 6, 7) and figures (4 and 5) which it is hoped will give the reader some interesting facts to consider. The possible situations and combinations are infinite and perhaps the tables and figures may act as a guide for more complete study.

In an endeavor to get some personal idea of the effect of deficiencies in the visual field, I drove many miles, first on the open road and then in the traffic of the city, under varying circumstances. First, I tried out the effect of cutting my own fields with Bel-O-Cluders. One pair gave a uniocular and binocular field of 100° (they are the same if under 160°, see Table 2), and the other pair a 40° field (20° each way). I had no sense of danger with either pair even at intersections; in fact, I had a sense of comfort by the blocking out of the blurred vision produced by speed (see Figure 9), particularly on the road over the hood. One can get the same sense of relief by blocking out the area over the hood with one's hand or a cardboard.

There was, however, a definite sense of deficiency in trying to look back on either side while changing from one traffic lane to another. This deficiency was overcome by viewing the right and left side mirrors and an inside-the-car multifaceted mirror, thus obviating the necessity of turning the head and body in changing lanes. It cannot be overemphasized that, in changing lanes or turning, safety can be greatly increased by signals, i.e., letting the other driver know what you intend to do.

While driving with these occluders, I noted that both sides of the road, the center lane, and oncoming traffic were all in the 30° range, even up to the view over the hood at 25 feet (see Table 5).

A further experiment was to drive with the central field occluded. I did this by placing adhesive or Scotch Tape on my glasses at the estimated 50° of central field (25°

Feet beyond left side of road									Road					Feet beyond right side of road								
Feet beyond driver	5000 + 16.5	1000 + 16.5	500 + 16.5	100 + 16.5	50 + 16.5	25 + 16.5	10 + 16.5	5 + 16.5	(c) 16.5	(b) 7.5	(a) 4.5	Path of car	(d) 7.5	5 + 7.5	10 + 7.5	25 + 7.5	50 + 7.5	100 + 7.5	500 + 7.5	1000 + 7.5	5000 + 7.5	Feet beyond driver
5000 + 8	45.1	11.5	5.9	1.4	0.8	0.5	0.3	0.2	0.2	0.1	0.0		0.1	0.1	0.2	0.4	0.7	1.2	5.8	11.4	45.0	5000 + 8
1000 + 8	78.6	45.2	27.1	6.6	3.8	2.4	1.5	1.2	0.9	0.4	0.3		0.4	0.7	1.0	1.8	3.3	6.1	26.7	45.0	78.6	1000 + 8
500 + 8	84.2	63.4	45.5	12.9	7.5	4.7	3.0	2.4	1.9	0.8	0.5		0.8	1.4	2.0	3.7	6.5	11.9	45.0	63.2	84.2	500 + 8
100 + 8	88.8	83.9	78.2	47.2	31.6	21.0	13.8	11.3	8.7	4.0	2.4		4.0	6.6	9.2	16.7	28.0	44.9	78.0	83.9	88.8	100 + 8
50 + 8	89.3	86.7	83.6	63.5	48.9	35.6	24.6	20.3	15.9	7.4	4.4		7.4	12.2	16.8	29.3	44.8	61.7	83.5	86.7	89.3	50 + 8
25 + 8	89.6	88.1	86.3	74.2	63.6	51.5	38.8	33.1	26.6	13.0	7.8		13.0	20.7	28.0	44.6	60.1	72.9	86.3	88.1	89.6	25 + 8
10 + 8	89.8	89.0	88.0	81.2	74.9	66.6	55.8	50.1	42.5	23.0	14.0		23.0	34.8	44.2	61.0	72.6	80.5	88.0	89.0	89.8	10 + 8
5 + 8	89.9	89.3	88.5	83.6	78.9	72.6	63.9	58.8	51.8	30.0	19.0		30.0	43.9	53.4	68.2	77.3	83.1	88.5	89.3	89.9	5 + 8
0 + 8	89.9	89.5	89.1	86.1	83.1	79.1	73.2	69.6	64.1	43.0	29.0		43.0	57.4	65.4	76.2	82.1	85.7	89.1	89.5	89.9	0 + 8
0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	Driver	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	0

TABLE 5. DEGREES OF ANGLE FROM DRIVER TO OBJECT

Driver's eye is 8 feet from front of car.
Average road is 24 feet wide.
Average car is 6 feet wide.
Driver's eye is 1.5 feet from left side of car.
Driver's eye is 4.5 feet from right side of car.
Overlap in each lane side of car or center strip to car, 3 feet.

The driver's (dominant) eye is:
(a) 4.5 feet from center line.
(b) 7.5 feet from near side of oncoming car.
(c) 16.5 feet from left side of road, and
(d) 7.5 feet from right side of road.

TABLE 6. RELATIVE ANGLES OF CARS AT CONSTANT SPEED WHICH WILL COLLIDE AT 3 SECONDS

Speed of driver	*Speed of other car* 90 m.p.h. 396 feet	60 m.p.h. 264 feet	30 m.p.h. 132 feet	15 m.p.h. 66 feet	*Stopping distance of driver's car*	*Stopping time of driver's car*
15 m.p.h. 66 feet	80.5	76.0	63.4	45.0	22 feet	1.3 seconds
30 m.p.h. 132 feet	71.6	63.4	45.0	26.6	75 feet	2.6 seconds
60 m.p.h. 264 feet	56.3	45.0	26.6	14.0	260 feet	5.2 seconds
90 m.p.h. 396 feet	45.0	33.7	18.4	9.5	635 feet	7.8 seconds

Source: Evans (101).

in each direction) leaving the periphery free and a central small hole about 4° in diameter. While I was able to drive under the circumstances, I found quickly that I had a feeling of irritation, discomfort, and danger; this was in marked contrast to the lack of these symptoms when the peripheral field was blocked out.

I even did the questionably justified experiment of putting Scotch Tape over the whole of each lens, which reduced the vision to 20/200, and blocked out the field to about 50° each way. (This is about the field inside of the average spectacle rims.) I was able to discern the center stripe sufficiently well to stay in my lane and to meet other cars without mishap. The Scotch Tape had the experimental advantage of giving the partial but uneven blur that one conceivably gets with a retinopathy, without the complete obstruction one would get with adhesive tape.

Furthermore, I noted that when I fixed steadily at varying angles from straight ahead, the center lane and the sides of the road became indistinct and inadequate as a guide to driving when the gaze was off center more than 10° to 15°.

TABLE 7. WIDTH AND LENGTH OF AVERAGE PASSENGER CAR*

Distance	*Width of car in degrees*	*Length of car in degrees*
At 1000 feet	0°04′	0°05′
At 500 feet	0°41′	2°04′
At 100 feet	3°26′	10°16′
At 50 feet	6°52′	20°25′
At 25 feet	13°42′	39°36′
At 10 feet	33°24′	84°00′
At 5 feet	61°55′	121°56′
At 1 foot	143°10′	167°15′

*The height of average passenger car is about 5.5 feet; width, 6 feet; length, approximately 18 feet.

Tables 5 and 7 give an idea of the angles produced by objects, cars, and width of road. One can work out the angle, suggested by Traquair (28) in discussing test objects. His formula is $\frac{\text{Test object}}{\text{Distance}} \times \frac{180}{\pi} = \text{angle}. \frac{180}{\pi}$ is a constant 57.3. Thus, the length of a car (18 feet) at the usual length of a city block is $18/400 \times 57.3 =$ 2.6°; or at 100 feet the angle is 10.4°; or, for example, the width (6 feet) of a car at 58 feet gives an angle of 6.9°, while the width of the 24-foot road at 58 feet ahead of a driver (see Table 5) is 23.7°.

At 57.3 feet (the same as the constant 57.3) the width of the object in feet is almost the same as the degrees subtended up to about 25° (see Tables 5 and 7). Interestingly, this distance of approximately three car-lengths is of definite importance, particularly in the predominantly intersectional driving in a city.

The statement frequently appears in the literature that in driving one should keep one's eyes moving. It may be quibbling, but it would seem more important to recognize and stress the viewpoint that, when one remains alert in driving, the eyes will automatically keep moving. Alertness also affects the field, in that it is well known that one sees quicker in any direction if one is expecting something from that area.

I also checked the effect of moving the eyes off the road and back at various angles and rates. In looking about 20° to the side I found that I could leisurely make about 16 excursions (32 movements) per minute. By consciously forcing myself to make more rapid oscillations, I could make as many as 60 excursions (120 movements) per minute, but only at the expense of dizziness and danger. Repeated turning of the eyes to the 50° limit could be done only half as fast, and with increasing discomfort and lack of safety. Although the findings here given are in excursions per minute, I found that tests longer than thirty seconds were fatiguing.

The glance to the side can be either rapid or slow, but if we estimate the time taken for an excursion to be one second, we will also have traveled during that time 120 feet at 90 m.p.h., 90 feet at 60 m.p.h., or 45 feet at 30 m.p.h. An easy rule to follow in figuring how far one travels in feet during a second is to take the speedometer reading and add half the reading to it. During this glance our macular fixation is off the road, but the road is usually in the field, depending on how far the turn (see Tables 3 and 4 and Figure 2). With the quick glance of small amplitude usually employed, the road remains in the central field. When the head and body are also both turned, the road is in the peripheral field or even out of it entirely.

There is need for a theoretical and experimental study by a mathematically trained traffic expert to correlate the factors of speed, reaction time, braking distance, stopping distance and time, angle of object to the side, angle subtended by object, and the visual acuity of the central and peripheral fields. A token effort has been made in this paper in Figures 4 and 5.

My impression on this subject is that beyond 60° the visual acuity is ordinarily so poor that we get little information. When the object in the far peripheral field can be intelligently perceived and recognized, it is already too late to prevent a collision (see Figure 4). This is particularly true at high speeds; in the lower speeds of city traffic, fortunately, the collision is less likely to be lethal.

However, if the reader will merely try to drive across a busy street on peripheral vision alone, he will have it dramatically impressed on him, that, in order to be safe, one must get a view each way with the better vision of the central field.

Experiments such as these on one's self might well be made a separate study, but let me give a word of caution. While driving during these personal experiments as just described, and in studying the use of mirrors, I almost had an accident several times, not because I could not see, but because I was thinking of something besides driving. The attention of a driver should be on *driving*, and not actively on *solving a problem*. Accident experts will verify the fact that a very large percentage of accidents happens when a driver is angry or otherwise actively mentally engaged.

Miscellaneous

Some miscellaneous perspective items may be given. (Lauer (48) quotes a newscast: "The State of Ohio is starting to revise its driver licensing program since it was discovered that six hundred of its licensed drivers were also receiving state blind pensions."

Sherman (49) says: "We believe that the time and effort required for perimetric tests can be used to better advantage in giving good tests of the more common functional factors of vision."

Figure 4. Angular relation and stopping time of cars

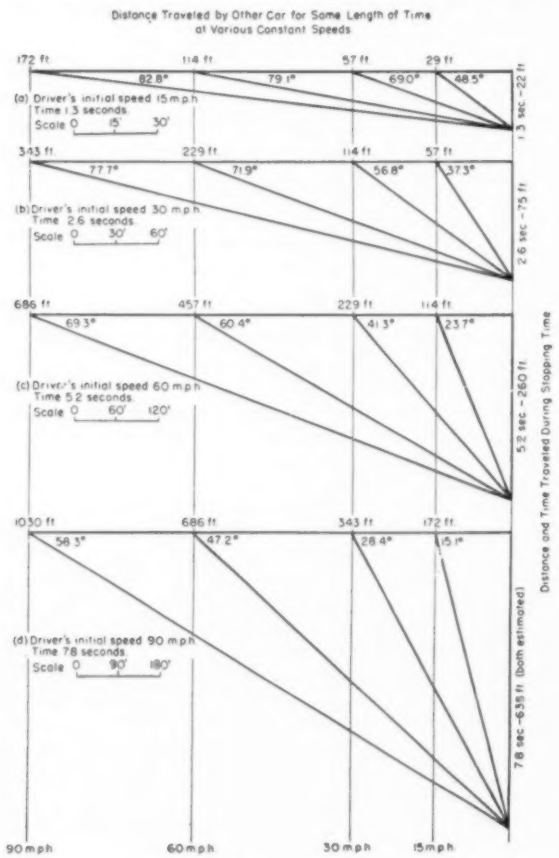
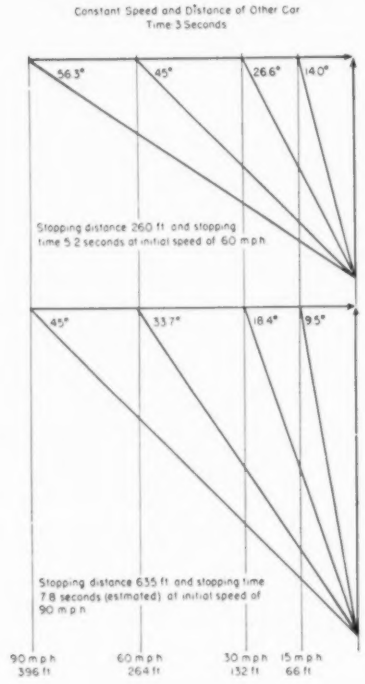


Figure 5. Angular relation of cars before collision


Constant Speed and Distance of Other Car Time 3 Seconds
56.3°
45°
26.6°
14.0°
Stopping distance 260 ft. and stopping time 5.2 seconds at initial speed of 60 m.p.h.
45°
33.7°
18.4°
9.5°
Stopping distance 635 ft. and stopping time 7.8 seconds (estimated) at initial speed of 90 m.p.h.
90 m.p.h. 396 ft
60 m.p.h. 264 ft
30 m.p.h. 132 ft
15 m.p.h. 66 ft

Selling (50) reports that 716 persons were reexamined because of accidents and violations, and in only five was the binocular field less than 140°; four of these were found to have serious neurologic disease.

An editorial in the *Sight-Saving Review* (51) says: "Studies of accident repeaters show that 20 percent of the drivers cause 80 percent of the accidents. . . . New York State examined several hundred drivers with four accidents apiece, and found that more than half of them had tunnel vision."

Calamandrei (6) recommends more rigid field of vision qualifications for drivers of racing cars.

Harman (13) and others have mentioned the obvious need of a field of vision for a pedestrian.

Emond (8), after making a study of a large number of employees, came to the surprising conclusion: "The greater the field of vision, the higher the accident index. . . . Drivers with few serious accidents tend to employ most of their relatively narrow fields of vision in *driving*, whereas the high accident index men employ their wider vision toward considerations *other than driving*." Emond also says: "The danger lies with the driver who does not know about his weakness."

Welsman and McCulloch (52) have written on fields taken with the same size test object at varying distance which, when recorded, are elongated instead of oval.

FACTORS THAT AFFECT FIELD OF VISION

Introduction

The many diseases and abnormalities which affect one's field of vision are to be found in the textbooks. Here we shall attempt only to discuss the conditions and situations which seem to have a reasonable relationship to safe driving. The fields of vision of a driver in an automobile are the personal fields of an individual from which are subtracted the limitations of the environment. In other words, we have conditions which may reduce one's personal or individual field, and those which are environmental and "obstruct the view."

The practical fields of vision of an individual, described above, are to a great extent dependent upon the alertness, attitude and ability of the driver. The environmental factors are largely out of the driver's control.

In practically all the discussions of fields in the literature, the central idea has been *how far out one sees*. It would seem to me that the most important feature to stress is *how well one sees* in the central field out to 25 or 30 degrees in each direction. It is of prime importance whether this amount of field, combined with motility and correct attitude, is sufficient for safety.

The factors that affect the personal fields may be discussed under the broad headings of (1) diseases of the media, (2) diseases of the fundi, (3) diseases of the visual tracts, (4) the blind spot, (5) the loss of one eye, (6) effect of drugs, (7) errors of refraction, (8) fatigue, (9) training, and (10) abnormalities of movement.

Cataract, Aphakia, and Corrected Aphakia

The most important disease of the media is, of course, cataract. This writer has felt for a considerable time that in determining the indications for removal of a cataract too much emphasis has been placed on its effect on visual acuity. Perhaps much more attention should be given to the effect of cataract and subsequent aphakia on the visual fields. In explaining to a patient the arguments pro and con for the removal of a cataract, particularly a unilateral cataract, I fear we have at times been guilty of an unintended distortion of full facts when we have said to the patient, "You will need a strong lens to bring out your ability to read, but you will need no lens to get back your field." The reader needs only to take a field on an eye with an immature cataract (vision down even to 20/100) and compare it with the field on the aphakic eye to see how little difference there is (Figures 6 and 7).

Figure 6. Comparative fields when vision is uncorrected

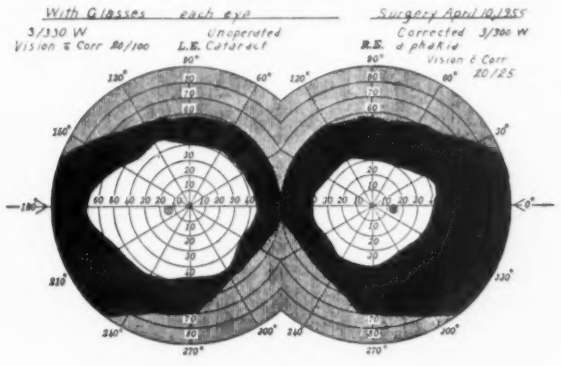
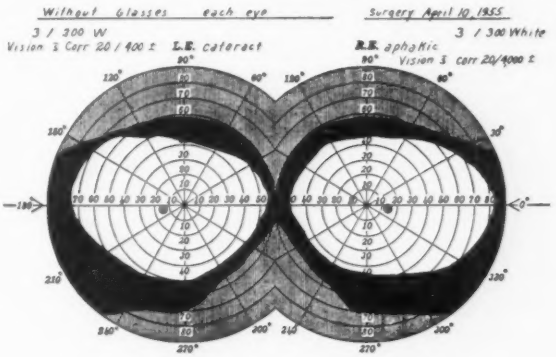


Figure 7. Comparative fields when vision is corrected


Without Glasses each eye
Surgery April 10, 1955
3 / 300 W
Vision & Corr 20 / 400 ±
L.E. cataract
R.E. aphakic
3 / 300 White
Vision & corr 20/4000 ±

That the strong correction for an aphakic eye of itself not only limits the range of clear visual acuity, but also alters the fields and produces ring scotomata, has been a subject of debate (53, 54, 55, 56). Goar (55) and Constantine (56) have contended that contact lenses increase the field, while Rogers (57), on the other hand, has found that certain types of contact lenses cause contraction of as much as 30 per cent in the field.

In order to get some additional information as to how cataracts, aphakia, and subsequently corrected aphakia affect an automobile driver, and particularly his fields, the writer sent out a questionnaire to a list of 232 consecutive cataract extraction patients in our office. Although there must be many factors and situations difficult to assay without careful analysis, these are the main findings on the basis of the replies received.

Of 130 queries returned, 72 persons polled said that they had driven a car before surgery, and 58 that they had not. Seventeen of the 72 had quit driving after surgery, but only one said it was due to poor field of vision. The others had quit driving for various other causes. Of the 72, six complained of increased difficulty in backing up and 18 had no complaints. Forty-nine said they had no trouble gauging distance from other cars; 18 did have trouble and 5 volunteered that cars seemed closer than they were. To the question as to whether they had trouble seeing on the side of the operated eye, 25 said "yes" and 30 said "no." Comments indicated that many more were bothered by difficulty in seeing to the side than in gauging distance. Four replied that they had trouble changing lanes and 48 had none. Thirty-five drove as fast as other drivers, 20 drove slower. However, 30 said that they stayed farther behind other cars than most people; 15 did not. There were 37 who had had no accidents before; none had had accidents since. In other words, not one person had had an accident since the surgery—ad-

mittedly, a short time, however. The logical conclusions then would seem to be that the admittedly defective peripheral vision in corrected aphakia does not deter most people from driving, and that the central field is adequate for safe driving.

A special questionnaire was sent to 43 patients for whom "unilateral" cataracts had been removed. Twenty-one said there was an increase in their ability to see to the side, one said there was a decrease, and 6 had noted no change. They were also asked whether the cataract removal helped in avoiding objects

(a) in the home: 14 said "yes" and 9 said "no";
(b) in the streets: 12 said "yes" and 8 said "no";
(c) in driving automobile: 5 said "yes" and 5 said "no."

Ten said they did not drive.

However, one of the most intelligent cataract patients that I have ever encountered wrote to me, "Having had a cataract extraction on both eyes in 1939, with each of these operations determined entirely successful, I state unequivocally that a person's vision following a cataract extraction is definitely impaired. . . . The field of vision is narrowed and one adjusts less well to light, particularly in driving through tunnels or in any place where instantaneous changes of light and darkness take place. . . . If I were a doctor operating upon a person past sixty, I would advise against his ever driving a car again."

In this connection, it should be noted that, to overcome this quick change, some tunnels are illuminated more at the ends than in the middle.

This brings up the fact, well known for many years but somewhat overlooked in our surgical rationalization, that the limits of the bilateral field are not greatly different from those of the unilateral field. This can be seen from the diagrams in any textbook. The unilateral horizontal field is $60 + 100 = 160$ and the bilateral field is $100 + 100 = 200$. Thus, the binocular field is only 25 percent wider than that for one eye.

Fundi

In discussing diseases of the fundi, I would reiterate the importance of the quality of the central field in contrast to that of the peripheral field. Most of the diseases encountered, such as retinopathy of diabetes and arteriosclerosis, senile and vascular degenerations, and early glaucoma, affect that area predominantly. In glaucoma, of course, we also get marked peripheral contractions.

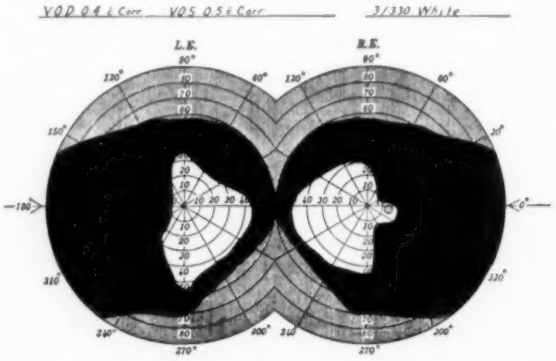
As for retinal detachment, it is the postoperative field that is important. The acute cases seek aid and quit driving. Interestingly, we have a forty-five-year-old patient who has undergone bilateral operations for cataract and repeated bilateral operations for retinal detachment. He now has complete reattachments with corrected aphakic vision of 20/40 in one eye and 20/200 in the other. His fields are limited to 25° or less in all meridians bilaterally. He has done a large amount of driving for a year without an accident, and assures me that he drives without much difficulty.

We have under our care a sixty-year-old deaf mute with only one eye, who had cataract surgery in 1948 and a retinal detachment operation in 1951, with corrected vision of 20/25, and a moderately reduced field. He has driven a car without accident or traffic violation ticket, notwithstanding his ten years of visual difficulty.

Visual Tracts

The field changes in injuries and vascular accidents are usually so sudden, and other accompany disabling factors so marked, that individuals with disabilities stop driving. However, in intracranial tumors, particularly of the pituitary, the changes are so slow that the patient adjusts to the new situation. Oleson (60) reports 16 cases of pituitary adenoma with marked field changes, five of whom had been driving cars, all without mishap.

Figure 8. Fields of driver with bilateral hemianopsia



I am herewith reporting a case personally observed (Figure 8) of a fifty-five-year-old pharmacist, who had driven 200 miles over mountain roads at the usual road speeds to get a pair of glasses so that he could read the price tags better. On examination, he was found to have a corrected vision of 20/50 in each eye, normal fundi, an almost complete bitemporal hemianopsia with marked contractions in other meridians. He said he had been driving at the same speed as other drivers with no difficulty other than that he had had to turn his head to the side a little farther than formerly in order to see at intersections. Here we have the unusual case of a driver who had slowly become accustomed to seeing the left side of the road with the right eye and the right side of the road with the left eye. He had no accidents. Dr. Max Kaplan, a colleague, tells me he has had a similar case. Since becoming interested in this subject, we have been amazed at the number of people with markedly defective visual acuity and fields of vision who admit that they are driving without much difficulty.

Blind Spot

The blind spot has been mentioned frequently as a possible cause of accidents. That it does not result in more trouble seems, offhand, to be peculiar, but is to be accounted for by (1) the field of the other eye, (2) the movements of the car, objects in the field, and of the eyes, head, and body (97), and (3) by the phenomenon of completion, as discussed by Duke-Elder (31) and Bender (104). Berens (40) stresses the importance in one-eyed drivers. I have prepared Tables 8 and 9 to illustrate the relation of the blind spot to the driver's field and to the road. Traquair's formula, previously mentioned, can be used to figure any particular distance.

TABLE 8. HEIGHT AND WIDTH OF BLIND SPOT

Distance from eye	*Height* (7.5°)	*Width* (5.5°)	*Relation to size of car*[a]
5000 feet	656.00 feet	480.00 feet	
1000 feet	131.20 feet	96.00 feet	
500 feet	65.60 feet	48.00 feet	
200 feet	26.24 feet	19.20 feet	*Approximate length of car*
100 feet	13.12 feet	9.60 feet	
50 feet	6.56 feet	4.80 feet	*Approximate width and height of car*
25 feet	3.28 feet	2.40 feet	
10 feet	1.31 feet	.96 feet	
5 feet	.66 feet	.48 feet	
1 foot	.13 feet	.10 feet	

[a]Width of car, 6 feet; height of car, 5.5 feet; length of car, 18 feet.

While doing the personal road tests described earlier, I also placed pieces of adhesive on my glasses in the position of the blind spot. When my car was not in motion, I could easily get the obstruction into the blind spot, but as soon as the car was in motion, I could not do it.

TABLE 9. DISTANCE OF CENTER OF BLIND SPOT TO SIDE OF FIXATION

Distance from eye	*Distance to side of fixation* (15.5°)	*Relation of road to driver*[a]
5000 feet	1386.50 feet	
1000 feet	277.30 feet	
500 feet	138.65 feet	*Center blind spot strikes road level*
100 feet	27.73 feet	
50 feet	13.86 feet	*Left side of road when driver is in center of his lane (76.5 feet)*
25 feet	6.93 feet	*Right side of road when driver is in center of his lane (7.5 feet)*
10 feet	2.78 feet	
5 feet	1.39 feet	
1 foot	0.28 feet	

[a]Center of blind spot is 1.5° below fixation and 152.7 feet from driver.

In the literature on traffic, we frequently encounter the word "tunnel vision" (58, 59, 12), but, for the record, we should call attention to the fact that tubular or tunnel vision is a result of a functional disorder such as hysteria or malingering, whereas organic disorders produce cone-shaped fields, which, when narrow, have been erroneously called tunnel vision (31). The significance of the increase in field with distance is illustrated by the following case report.

CASE REPORT. One of the most illuminating cases that we have encountered is a sixty-five-year-old woman who has had peripheral pigmentary degeneration of the retina since childhood. Her corrected vision is 20/25 in the right eye and 20/20 in the left. The 3/330 mm. white field of each eye (and, therefore, the binocular field also!) is not over 20° total. Yet this woman claims that she has had no accidents in forty years of daylight driving in familiar territory.

Her complaints, oddly enough, are not related to driving, but to activities close to her. She says she has more difficulty as a pedestrian than as a driver, not only in avoiding objects, but in walking with people without straying away from them. Her main trouble is in doing her own housework and in cooking; she is continually breaking dishes while putting them away in a cupboard.

This can be explained, because a 20° field at 1 foot is 0.35 of a foot (about 4 inches); at 3 feet, it is about 1 foot; at 10 feet, it is 3.5 feet; at 100 feet, it is 35 feet, and at 1,000 feet, 353 feet. At 50 feet, it is the length of a car, and when combined with a 50° turn of the eyes, 60° turn of the head, and 50° turn of the body, we have 170° as the limit on either side that can be seen. Of course, the deficiency of field is thus very large and includes all of the road and both sides of the road except for the small cone of field.

Loss of One Eye

Entire loss of visual field of one eye, either by disease or enucleation, is important because of its frequency. Much has been written about the one-eyed driver by Holmes (61), Berens (40), Weekers (62), Manes (63), Schwarz (64), Kerr (66), and others. DeSilva (1) gives a list of the difficulties a one-eyed driver encounters.

TABLE 10. ANSWERS TO A QUESTIONNAIRE SENT TO INDIVIDUALS WITH ONE EYE

1.	Questionnaires sent out	225
2.	Questionnaires returned	81
3.	Eye removed	Right 41, Left 40
4.	Number who had not driven before eye removed	34
5.	Number who had driven before eye removed	46
6.	Number who had driven since eye removed	41
7.	Number who quit driving because of smaller field	None
8.	Trouble in gauging distance from other cars	Yes, 10 No, 36
9.	Any difficulty seeing cars on side eye removed	Yes, 20 No, 21
10.	Any difficulty seeing cars on side eye not removed	Yes, 3 No, 33
11.	Any difficulty in changing lanes easily and safely	Yes, 6 No, 41
12.	Drive as fast as average drivers	Yes, 22 No, 18
13.	Those who had accidents before eye removed	10
14.	Those who had accidents after eye removed	9
15.	No accidents before or after eye removed	24
16.	No accidents before eye removed	32
17.	No accidents after eye removed	33
18.	Difference in accident rate and difficulty in driving—right or left eye	None

The effect on the driver of losing an eye depends on the suddenness of the loss. Weymann (38), Schwarz (64), and Berens (40) have suggested a mandatory period of adjustment after enucleation of a previously good eye before a person should be permitted to drive again. If a foreign body suddenly strikes an eye, we close the eye and lose the field of that eye; theoretically, this could cause more trouble if in a poorer-winking and dominant eye (67). In the tables the "position of the eye" is, of course, only approximate, depending on many obvious variable factors.

In order to get the personal reaction of a group of people who had lost one eye, we sent a questionnaire to 225 individuals who had had an eye removed. The answers are tabulated in Table 10. It is realized that many factors enter into driving ability after loss of an eye, but perhaps these answers are of some value.

A very intelligent man for whom I removed an eye eight years ago insists that, because he now takes more precautions and pays more attention to his driving, he is a much safer driver than when he had two eyes.

One might assume that a one-eyed driver could increase his nasal field by looking temporally, but such is not the case. Let the reader try it for himself (28, 31). For instance (Tables 1, 2 and 3 and Figures 2 and 3), if the driver with a remaining left eye turns his eye 50° to the left, he has only 10° field on the nasal (right) side of straight ahead on the road, and if he also turns his head

and body to the left, the nasal side of his field will be entirely off the road to the left, leaving all to the right side of the road entirely out of his field.

Fortunately, the one-eyed driver can, if he wishes, use mirrors frequently, and can thereby utilize the clear view of the central field as contrasted to the poorer vision in the peripheral field. The fact that it is the central field that is utilized in mirrors has not been fully appreciated.

Drugs and Toxic Agents

Drugs have not been considered to have much effect on the fields of vision. There is no reason to believe that the drugs (e.g., methamphetamine, Dexedrine, Benzedrine), so commonly used to keep awake, have any effect on the fields except indirectly, through alertness. Recently, articles have appeared in the literature on the improvement of fields in glaucoma (McGuire 65), and in retinitis pigmentosa (Leo and Lidman 69), by the use of Dicumarol. Brody (3) mentions acute oxygen want as a cause of contraction of the field.

As for toxic agents, alcohol would be the most common. Its effect on judgment is well known. The traditional diplopia and confusion involves the fields as well as the point of fixation (Brecker, Hartman and Leonard 68). King (59) noted no diminution in the field but reports a slower reaction time in responding to peripheral stimuli. He discusses the literature on the subject.

Errors of Refraction

The effect of errors of refraction upon visual acuity is obvious, but the effect on the fields of vision, particularly the central fields, has been given entirely too little attention, both in the testing of the field and in its relationship to driving ability. If the reader with considerable error of refraction will observe its effects the next time he is driving without his glasses, he will notice the lack of clearness which bothers him is not so much related to the point of fixation as to the central fields. Fergus (70) describes how seamen and miners use their fields of vision adequately in spite of much nearsightedness. Carreras (71) says that in uncorrected high myopia, "the field change consists of a relative depression of the central field, with an intact periphery." The scotoma of amblyopia ex anopsia (Irvine 24) is in the central field, and usually associated with a relatively higher refractive error. Sachsenweger (102) found accidents no more frequent in myopia than hyperopia.

Training and Attention

There has been some discussion to the effect that field can be improved by training (4, 72, 103). Low (73) has done an excellent piece of research on (1) the development of a standardized measure of peripheral visual acuity; (2) an investigation of the practicability of training the peripheral function to insure better performance. He reports that "with about 25 hours of practice, peripheral acuity was successfully trained in 43 subjects to a measure that was 334% of the starting score. . . . There was successful transfer of the effects of the training to both other laboratory situations and conditions of outside life." Brody (4) calls attention to the tachistoscopic training of recognition of airplanes during the war, and cites Helmholtz and William Jones as believing the periphery could be trained.

Fatigue

We are all familiar with the fatigue field illustrations of Traquair (28) and Peter (74). It would seem logical that fatigue could affect the fields of a driver (Brody 3). Perhaps fatigue also could accentuate the peripheral intermittent physiologic scotomata reported by Low (73). It would also seem possible that the poor vision in the central fields could produce and increase fatigue (Lauer 103).

Abnormalities of Movement

By referring to Tables 1, 2, 3, and 4, one can see that abnormalities of movement of the eyes affect the binocular fields to some extent. In convergent strabismus, the binocular field decreases until at 60° it is almost the same as the monocular field of the fixing eye. In divergent strabismus, the fields cannot be increased by more than 20° (10° each eye limit of increase by looking temporally). Peculiarly, in most cases of paralytic strabismus, the normal binocular field is approximately the same whether looking in the field of the paralyzed muscle or not.

The practical fields, however, being larger primarily because of movements of the head and body, are greatly reduced by limitations such as in arthritis. One of the most brilliant and useful scientists in our city is handicapped, not only by extreme lack of mobility of his head and body, but also by poor visual acuity from the effect of repeated attacks of iritis. Fortunately, his fields are quite wide. However, he tells me that he compensates for his lack of movement by using a multifaceted rear vision mirror which enables him to see all around his car by merely moving his eyes. This individual has given much very intelligent thought to means of compensating for his handicap and I wish space would permit including his set of rules. One suggestion regarding left hand turns should be passed on. He says he goes one block beyond the traffic signal and, by making a series of right hand turns, can cross the street with the traffic.

This case illustrates the viewpoint of most motor vehicle departments, which is to help handicapped people with suggestions so that they can be safe drivers rather than to refuse a license. It would be a great loss, not only to the above-mentioned scientist, but to the people of our city, if this individual were prevented from driving.

Environment, Including Speed

The factors in the environment which limit the fields are probably more important than the person's own fields. Outside of the car there are: (1) general obstructions, such as dust, fog, rain, and snow; and (2) local obstructions, such as other cars, trees, shrubs, buildings, signs, and curves in the road, as discussed by Smeed (75) and Lebensohn (37). Inside the car we have: (1) poor visibility through windshields and windows due to dirt and stickers; (2) obstructions to the view by objects in the car; and (3) obstructions even on the person, such as large hats and heavy frames to spectacles.

Allied to outside obstructions are the variations in amount and position of lighting, such as darkness, too much light, glare, and "visual noise," such as moving electric signs. Electric signs with rapidly moving designs, particularly of the on and off type, when in the central field are not only distracting (that is their function) but may be otherwise dangerous, because of the phenomenon

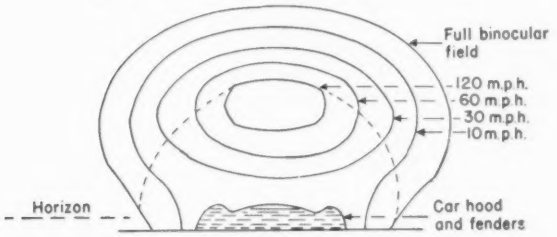
of extinction as described by Duke-Elder (31) and by Bender (104). They should be prohited near traffic lights.

An electric sign or light in the central field should never be brighter or more attractive than the traffic light itself. We have all experienced the extreme fatigue resulting from facing glaring lights in the field. In fact, some mathematical formula should be devised by an illumination engineer which would take into account the intensity of the light and the nearness of that light to the area of macular fixation.

The lowered accident rate with increased lighting has been stressed by Fletcher (2a, 2b), Luckeish and Roper (76), and Lebensohn (77). The method of making markers in the field more conspicuous, by such means as reflectors on curves on road, and on cars and bicycles, is well known. Now, however, luminescent suits for pedestrians at night and reflectors for the sides of railroad boxcars (78) are also being advocated. Heber (79) condemns tinted windshields because they decrease contrast at night. Zade (80) reports annular scotomas in fliers from looking at the bright sky. This could also happen to automobile drivers. The difference in visibility between a black top and a concrete road is obvious.

Another factor modifying particularly the peripheral field is the effect of speed. The faster the speed, the narrower the clear zone (Figure 9). This "speed smear" (my term) does not bother us until we approach the central zone, and accounts for the fact that for comfort, the faster we go, the farther ahead of the car we look progressively (81). When landing a plane, airplane pilots fix at a considerable distance ahead to avoid this smear.

Figure 9. Diagrams of "speed smear"



Byrnes (82) believes part of the discomfort is due to the rapid changes in size of objects. It is unfortunate that this speed smear does not impart to the driver more of a sense of danger, such as one gets while standing by the side of the road when a car speeds by. It would be interesting to determine any tendency to a vertical optokinetic nystagmus (31) produced by the over-the-hood smear.

The view over the hood of the average car allows us to see the ground about twenty-five feet ahead, whereas a bus driver can see as close as six feet. Thus, a bus driver has more need for good inferior fields than does a passenger-car driver, and he is bothered more by the speed smear.

Road signs are recognized not only by the captions thereon, but also by their shape. The shape of objects is effectively seen only in the narrow macular and perimacular zone of the total field. In view of high speeds, road signs should be sufficiently large and of the proper shape to be recognized properly at long distances.

Apparatus and Methods Now in Use

Some of the many types of apparatus and methods for doing field of vision screening that have been used and proposed by others are:

1. The familiar confrontation test as described in many textbooks (83, 84) has been used satisfactorily by Leinfelder (85) and many others for rough field testing for driver's licensing. It should be recognized, however, that as described as a comparison with the examiner's fields it will measure out temporally to only about 70° (and is similarly restricted in other fields). To get a measure of the person's full field by finger movements or test object, one must bring the test object from behind his head, in which case the 90° field for the examinee will be about 60° for the examiner. In using fingers in the test, we have found that the candidate reacts quicker and easier if white thimbles are placed on the examiner's fingers. The movement of the fingers should be stressed, for motion field is larger than the mass or form field, as described by Brombach (86).

2. The American Optical Company Sight-Screener (87) has a field of vision attachment that will measure from 100° to 60° temporally.

3. The Bausch and Lomb Orthorater (88) has an auxiliary attachment which permits measurement down to fixation.

4. The Periometer of the Keystone View Company Telebinocular (89) also measures down to fixation. Imus (90) has compared these three frequently used battery screening devices, but not as regards fields.

5. The American Automobile Association (91) has a table screener on legs, and a driver evaluator with a field attachment. This measures down only to 65° and only on the temporal side.

6. Homemade types of plywood boards cut to fit the nose with angles marked at the periphery have been recommended by Reid (92), Lauer and Kotvis (25), and Nuchols and Lauer (34), with the angles subtended marked at the edge of the board.

7. Fletcher (2f) says the office type perimeter and the Schweigger hand perimeter have been used.

8. Harrington and Flocks have devised a screener that utilizes tachistoscopic illumination by an ultraviolet light of patterns made with luminescent ink. A description of its advantages and uses has been given by them (93, 94, 95, 96). It departs radically from other field of vision screening machines in that it measures the central fields instead of the peripheral fields. It is the belief of the inventors that most lesions of the periphery will show centrally. In fact, of course, many clinics and ophthalmologists use the central fields more than the perimetric examination. This method also differs in that it measures in all directions, while the other methods have measured only temporally.

Although the screening method of Harrington-Flocks has been utilized to advantage in many ways, no report is available on its use as part of a driver's test. The writer, therefore, decided to test a group by this method and at the same time try out some of the other screening devices for a partial comparison. Inasmuch as all the emphasis

on driver's fields up to date has been on *how far you see to the side*, the method, which measures central fields to 25°, seems offhand not to have much value as a test. Nevertheless, ophthalmologists have known for a long time that in diagnosis the field changes in the central area are just as valuable as those in the periphery and perhaps more so, and one wonders whether the emphasis should be rather on *how well you see in the central area.*

This testing at the driver's bureau was done on volunteers by an examiner who knew little about eyes. This immediately brings up the research defect of inadequate controls and follow-up. Yet, there was some advantage in doing the tests in this manner, which simulates more nearly the conditions under which the tests would be made if the method were adopted for screening. However, to anyone who might be interested in going into field screening research in more detail, we would suggest that it be done at a private or public clinic over a period of years on thousands of cases, where diagnoses, and repeated and multiple tests, are available. One could then compare these findings later with the driver's records of safety in the Motor Vehicle Office of the area.

The work was done in the summer vacation by a first year medical student. It was impossible for him to examine all the drivers. The regular examiners were therefore instructed to refer the following cases, which, of course, overlap:

1. Visual acuity on the borderline of, or below, passing (in the State of Colorado the standard is 20/40, one or both eyes, with or without correction): 117 cases.
2. Age over sixty-five: about 100 cases.
3. Strabismus: about 10 cases.
4. One-eyed drivers, i.e. eye lost or blind: 18 cases.
5. Those considered otherwise interesting: about 20 cases.
6. Drivers over 50, when above classes not available: about 400.

This represents a selected group of about 4 per cent of all those being examined on any one day. The reject rate on licenses is about 1.3 per cent.

Although the total number of volunteers examined (680) seems rather large, it was early realized that from the accident viewpoint (in view of many factors involved) any correlation would be statistically valueless. Patients were asked about their accident records (replies to such questions are notoriously unreliable), but no investigation was made. Suffice it to say that no cases were encountered in which a defective field of vision was believed to have caused an accident.

Due to the fact that alterations were being made in the building during the testing, it was necessary to use two different rooms. Most of the work was done in a separate small room with a small window to the back and right of the volunteer. Directly back of the subject and apparatus was a door opening to a lighted hallway. There was also a light in the ceiling to be used when necessary. The light in this room, therefore, during the testing, varied from about two to seven foot candles, depending on the time of day and number of lights turned on. The large room was the main examining room, where there were present twenty-five to one hundred applicants and employees at all times. Ninety-three were examined in the large room and 507 in the small room.

Results of the tests are summarized in Tables 11, 12, and 13. Of the 680 applicants tested, Table 12 shows that there were 117 who had vision of 20/40 or less in the poorer eye. With the Harrington-Flocks method, 53 missed all patterns, 27 missed some or part of a pattern, and 37 missed no patterns. Of the 27 missing some patterns or test objects in the patterns, 7 had visual acuity of 20/70 or less; 8 had 20/40 or better, and for the remainder there is no record. The diagnoses furnished by the drivers were cataracts, 5; glaucoma, 1; trauma, 2; "hemorrhage," 1; surgery for *tic douloureux*, 1; macular degeneration, 1; amblyopia ex anopsia, 2; the remainder are not known.

Table 11. General Tabulation of Field of Vision Tests

1.	Total people tested (in categories listed in introduction)	680
2.	Number referred because vision 20/40 or below	117
3.	The remainder in other categories (see explanation)	563
4.	Tested by the Harrington-Flocks method	680
5.	Peripheral fields also tested by Keystone Periometer	340
6.	Peripheral fields also tested by American Automobile Association Screener	340
7.	Peripheral fields also tested by American Optical Co. Screener	20
8.	Peripheral fields also tested by finger movements	350

It was noted that failure to see the targets was three times as frequent in the upper fields as in the lower. A colleague, Dr. Paul Wetzig, who uses the machine on all refraction cases and diagnostic problems in his private practice, says that he also has noticed this predominance of loss in the upper field. Furthermore, in these partial loss cases, the loss was usually of the smaller patterns.

For added information, the 35 drivers who had missed all of the patterns and the 27 who had missed some of the patterns or test objects were asked by letter to volunteer again for more testing, this time at the Medical School Clinic. Only 5 of the 35 appeared. Three could still see no patterns; two could see some, one, only if larger test objects in the patterns (designed by us) were used. All cases had vision below 20/40; 4 had organic pathology; the fifth had severe amblyopia with esotropia and he volunteered that he thought he missed them all at the first test because he had taken a "glare" test just previously. The peripheral field of all was better than 60° temporally.

Of the 27 who had partial loss of patterns, 10 reported for reexamination. Interestingly, all 10 of them were able to see all the targets, but 2 of them only when the larger targets designed by us were used. Unfortunately, the peripheral fields were not repeated. Pathology was found in half of these cases and, therefore, it would seem fairer to say that in some defective eyes the test will vary according to conditions, rather than to call the results false positives. Perhaps the phenomenon of extinction enters into this situation. In these cases, I believe the better reading on the subsequent examination was due to the fact that the second tests were done in lower illumination and in a more uniform peripheral background.

Twenty-two of the 680 subjects were so-called "re-examinations" because they had had several accidents or traffic violations. Only one had a Harrington-Flocks defect; he had run into the rear of another car. Three had peripheral contraction on the Keystone to 70°. Of the 11 who

had had intersection accidents, none showed a defect by any method.

Table 12. Comparison of the Central Field Tests by Multiple Pattern Method with the Peripheral Tests by other Methods

1. Number seen with vision 20/40 or less in poorer eye (most around 20/100 or less. (This includes those of other categories, who also had poor vision.)	117
2. Number who missed all stimuli of all patterns of Harrington-Flocks apparatus	53
a. Blind in one eye	18
b. Remainder	35
a(1) Peripheral (temporal) contraction to 80° or less	4
a(2) Peripheral (temporal) contraction to 60° or less	3
b(1) Normal peripheral field	31
3. Number who missed some patterns or some stimuli on a pattern	27
a(1) Temporal contraction to 80° or less	12
a(2) Temporal contraction to 60° or less	4
b(1) Reading above 80°	15
4. Number with no patterns or stimuli missed	37
a(1) Temporal contraction to 80° or less	8
a(2) Temporal contraction to 60° or less	4
5. Summary: other than blind eye	
a. Total and partial failure to multiple pattern method (35 + 27)	62
b. Temporal contractions to 80° or less	24
c. Temporal contractions to 60° or less (of the 24)	11
d. Ability to see finger movements only	4
e. Inability to see any targets anywhere	2

Of the 340 subjects tested by the Keystone apparatus, 127 showed a peripheral field reading of 80° or less. Of these latter, 111 had a normal reading by the Harrington-Flocks method; 16 (including 9 blind) had an abnormal reading. This high figure of 127 seemed odd, until the technician called my attention to the singular fact that of those 127, 93 had been tested in the large room and only 34 in the small, more ideal, room. Of the 93, only 7 were above 80°.

Table 13. Peripheral (Temporal) Readings by Various Methods

I. Number tested by Keystone Periometer	340
1. Number tested in small room (see explanation)	247
a. Temporal measurement more than 80°	213
b. Temporal measurement 80° or less	34
a(1) Temporal measurement 80° or less (9 blind not included)	25
b(1) Temporal measurement 60° or less (9 blind not included)	2
2. Number tested in large room	93
a. Temporal measurement more than 80°	7
b. Temporal measurement 80° or less	86
a(1) Temporal measurement 60° or less	2
3. Total both rooms (93 + 34)	127
a. Loss to 80° or less (blind not included) (25+86)	111
a(1) Loss to 60° or less (blind not included)	4
II. Tested by American Automobile Association apparatus (all in small room)	340
a. Temporal measurement more than 80°	321
b. Temporal measurement 80° or less (including 9 blind)	28
b(1) Temporal measurement 60° or less	None

These facts point out the need for an ideal environment for taking fields, even screening tests. In the large room there were in the environment (1) variable lighting in the field, (2) points of glare from several overhead strong lights, (3) objects of variable contours, (4) examiners and people, many with white shirts, moving about and (5) an audience of many people watching the test. It should be recognized that the proper environment and background, and cooperation and attention of the patient, are much more necessary for a correct field determination than for merely taking visual acuity. It should be mentioned that even the Harrington-Flocks apparatus worked better in both rooms when shielded.

It should also be mentioned that, in testing with the Keystone, the testee often mentioned that he saw the vertical black arm holding the target as soon as or sooner than he saw the target. However, for practical purposes it makes no difference.

Of the 340 tested by the American Automobile Association machine, there were 28 with some defect to 80° or less; of these, 9 were totally blind. Of the remaining 19, 8 read 80° and 11 read 75°, and none less than that. This smaller number of defects recorded by the A.A.A. machine than by the Keystone apparatus is to be accounted for by the facts that: (1) all A.A.A. tests were done in the small room; (2) there are two shielded lights in the apparatus for illumination; (3) there is a flange to block out the background; (4) on some models the test object, on which there is a cross, turns and gives more of a sensation of motion; and (5) the test objects, although of the same width, are closer to the eye, thus increasing their relative size. The round test object of the Keystone—one-half inch at 18 inches—subtends an angle of 0.8°. The oblong test object at 8 inches on the A.A.A. is $\frac{1}{2} \times 1$ inch and subtends angles of 1.8° and 3.6° respectively. At my suggestion, the local examiners have built the flange on the A.A.A. machine two inches high to obliterate the environment even more and give a better background.

Capt. Dahlstrom, of Denver, who has supervised the examination of 7,000 drivers for the Police Department and 2,000 for a truck rental company, using the A.A.A. apparatus, makes the astounding and almost incredible statement that, if the cases with a blind eye were ignored, only 1 case had been found where the temporal reading was under 60°. He estimates that over 95 per cent of those tested had a reading of 90° or more.

Furthermore, the Driver's Bureau and the American Automobile Association representative report that from a study of thousands of cases in their High School education program, it is very rare to find a student with a significant field defect.

The size of the test object for screening should be larger than that used for clinical testing. In an office a patient does not cheat, for he comes for diagnosis and relief of symptoms and the finer the test, the better. The finer the test, the greater the chance of false readings, but the ophthalmologist is aware of the chance of false answers and proceeds accordingly. In a screening procedure, however, the aim, for the sake of public relations, should be as sure as possible that cases are not incorrectly referred. We are all aware of the indignant parent whose child has been referred to an oculist's office by a too strict visual screening program.

The driver examiners can tell you of many such instances. The subject has been discussed by Kerrick (11). One Colorado driver recently took his grievance to the governor of the state, demanding that the examiner pay the oculist's fee that he had incurred.

Therefore, the following measures should be taken to avoid unnecessary referrals and refusals of licenses: (1) a

trained examiner who has been taught the pitfalls; (2) a special and separate room for proper environment and background; (3) proper illumination for the test being used; (4) larger test objects; and (5) opportunity for checking findings two or three times, as recommended by the A.M.A. Committee (29).

Our experience with field determinations by finger movements, done on 350 candidates (see previous discussion), is that the results are about the same as with the Keystone (properly used) or the A.A.A. The moving finger technique cannot be suitably recorded, but has the advantage of handiness and motion, and, in my opinion, is entirely adequate for finding gross defects. Many excellent neurologists use it for even finer localizing work in diagnosis. Most civilian airplane pilots are tested for field of vision by the finger movement test only.

The advantages of the A.A.A. apparatus are: (1) It is handy to adjust the face. (2) It is easy to explain. (3) The fixation is better because it is binocular. (4) The cross on the target turns. (5) There is uniform background for contrast. The disadvantage is that it measures only down to 60°, and there is no nasal reading.

The advantages of the Keystone Telebinocular with Periometer and the Bausch and Lomb attachment are: (1) It is part of an apparatus already used in many places for testing visual functions, particularly visual acuity. (2) It measures all angles from 90 to zero degrees. The disadvantages are: (1) The subjects do not fix as well as on the A.A.A. apparatus. (2) The targets do not have "oscillation." (3) It is not easy to read the dial and watch the patient's eye for fixation. (4) There is no uniform background. (5) The forehead rest is apt not to be in the center of the forehead.

The Harrington-Flocks test has the following advantages: (1) It tests the extrafoveal area most used in high speed driving. (2) The test is more independent of environment and background than most of the peripheral field techniques. (3) It is more apt to pick up defects of field that point to concomitant diseases which, of themselves, make the patient more dangerous on the road. (4) It is the only machine that tests in other than the horizontal field. The disadvantages of the method are: (1) There is possibly a greater chance of getting false positives or variations at different examinations. (2) Fixation of the patient cannot be watched well, particularly when testing the right eye. (3) Examiners and applicants are more impressed with the peripheral field tests. (4) It is not wholly satisfactory in aphakia or high errors of refraction. (5) An additional machine is necessary. (6) Poor results are obtained in testing older people.

Twenty persons were tested by the American Optical Sight Screener. That machine has the advantage of being convenient to use, but has these disadvantages: (1) It tests down to only 60°. (2) The examiner has more difficulty in explaining to the candidate. (3) It has the same defect as the Keystone and A.A.A. machines, in that it does not have sufficient "movement" feature.

A word about how errors of refraction affect the fields is advisable. Harrington has called attention to the fact that his test does not do well in uncorrected and corrected aphakia. It has been noted by us in these experiments and in our office that people with high corrected or uncorrected errors of refraction are apt to have difficulty in the test. I have noted with tests on myself that I saw the patterns more clearly through the segments of my trifocals than in other parts of the field. All tests would be more exact if there were a single lens with correction adjusted to the distance tested; this, of course, is impractical.

Conservation of time in driver testing is needed. In the California questionnaire (above referred to) it was stated that it had been estimated that one minute added to the examination would necessitate the hiring of 18 more full-time employees. However, it must be stressed that too much emphasis on haste in field taking is definitely not advisable, for an improperly taken field is of less value than none at all.

My technician estimates that it takes about three minutes to adjust the patient, explain and do the test, and record the findings in the peripheral (horizontal only) screening tests by the A.A.A. apparatus or by the battery type instruments with field of vision attachments. The Harrington-Flocks Multiple Pattern method for central fields in all directions takes about two to three minutes to perform, and another two minutes to record if the results are found to be abnormal; this time can be lessened if our suggestions are followed. The confrontation test with fingers, or with a white ball (not a disc) can be done in one minute and easily recorded in another minute. I recommended that the white ball be one inch or more in diameter and be placed on a thin black or grey wand. The angle could be estimated reasonably accurately by a trained examiner and quickly recorded on a form with the four (or eight) directions printed for each eye.

The combination that would give the most information for the time spent would be to do both the multiple pattern and the confrontation tests; the two could be done and recorded in four to six minutes. During that time, the examiner could also get a definite idea of the driver's thinking capacity as part of the total information desired in deciding whether to grant a license.

The estimates given here are for binocular tests, but do not include the time that would be taken to sort out a driver from the line and to take him to a suitable testing place. Where many people were being screened, much time could be saved for the examiner and examinee (although it would add another employee) by having an assistant recording the findings as the test proceeds. Perhaps eventually an automatic recorder might be invented that could be operated by merely having the examiner press buttons on a nearby machine.

Conclusions and Recommendations

From a study of the literature, from theoretical considerations, from a study of cases, and from personal road experiments, the following conclusions seem warranted:

1. Almost every accident can be logically ascribed wholly or partially to: (a) defects in the car, road, illumination, traffic control, and the view available, or (b) driver failure and defects such as improper attitude, psychotic personality, speed, unsafe driving habits, fatigue, alcohol intoxication, and the lack of sense of danger in the modern ultracomfortable car on smooth roads. This driver failure group is by far the more important.

2. The paradox of the obvious need for some field of vision in driving and, withal, the lack of any reliable proof or statistics that field defects cause accidents except rarely, can be explained by these facts: (a) there is usually no reasonable connection between a defective field of vision and the known causes of accidents listed above; (b) a very small percentage of the drivers has a major field defect in either or both eyes; (c) there is a tremendous increase in the practical fields of vision of even those with definite field defects by the movement of the eyes, head, and body; (d) by means of mirrors much of the driver's peripheral field can be brought into his central field; (e) major field defects are frequently due to serious physical disease that, of itself, prevents an individual from driving; (f) a driver who knows he has a handicap takes extra precautions; (g) most of the disabling field defects are associated with a loss of visual acuity which is below the limit permissible for a driver's license.

3. A full field of vision is, of course, valuable in driving. However, if a physically and mentally sound driver obeys the traffic laws, intelligently takes precautions, and has a visual acuity of 20/40 or better in his better eye, he can operate an automobile with reasonable safety if his total (nasal and temporal) binocular or monocular field is as low as 50°.

4. However, an applicant with any consistent loss of a portion of his central field, or a constriction of the peripheral field to 50° in any direction, should be referred to an ophthalmologist for a diagnosis and opinion, and should be reexamined every year.

5. Perhaps we may be permitted to make the unrealistic statement that the accident and death rate would be very low if all had poor visual acuity and narrow fields, and drove in a manner (particularly in regard to speed) that would be commensurate with such a hypothetical situation. *It is the liberties and habits of driving permitted by good vision that kill us.*

6. The quality of the central field is more important in driving than the quantity of the peripheral field, and the preference in testing should be given to the central field.

7. However, where funds and personnel are available, it would be well to test both the peripheral field and the central field. This would have the additional advantage of selling the driver the idea (which is so important) that he has a defect and that the motor vehicle department has a record of it.

8. A field of vision test should include the nasal field as well as the temporal—particularly in one-eyed drivers, and especially when the left eye is defective.

9. The best screening apparatus yet offered to measure the central fields of drivers quickly is the Harrington-Flocks Multiple Pattern Method. As constructed, however, it tends to give too high a percentage of false positives in driver's examinations and it is recommended: (a) that it be done in an evenly and dimly lighted room away from extraneous influences; (b) that the inventors carry out their announced intention to modify the instrument for specific situations by making fewer patterns, by using larger test objects in the patterns, or by designing the patterns with the view of uncovering the quantity of the field lost rather than to give hints as to diagnosis; (c) that it be repeated on separate days.

10. In view of the shortage of personnel and the lack of evidence that field defects are a common cause of accidents, it would be well to restrict the testing to: (a) accident repeaters—particularly intersection accidents; (b) those with visual acuity on the border or below the passing level in either eye; (c) drivers over seventy; (d) those who in the course of other examinations lead the examiner to suspect field defects; (e) drivers who cannot move the head and body easily, as in arthritis, or those with lack of normal movement of the eyes.

11. All disqualifying tests—and particularly field tests—should be repeated two or three times and should be consistent. (See A.M.A. report [27].)

12. Every state or large testing station should have: (a) a separate room for special tests such as fields, glare, coordination, and battery type vision tests; (b) consulting ophthalmologist to supervise tests and to act as a referee and advisor.

13. I agree with previous writers (39, 40, 41, 105, 106, 107, 108) who have urged that ophthalmologists should take more interest in safety, and should take time to acquaint their patients with defects which affect their driving. They should cooperate fully with the Drivers Bureau, and take seriously the job of examining drivers for a license. The oculist should have the courage to tell a patient with a disabling defect that he should not drive. Above all, as citizens, we should back up the law enforcement agencies and exert our influence toward decreasing the main causes of accidents, which fall largely in the areas of attitude, habits, and alertness.

Summary

This pilot paper has been written to indicate the many facets of the problem of the relationship of fields of vision to safety in driving. It would appear that defects in the driver's fields of vision are a very minor cause of accidents, but further research is needed in many areas to get a more complete answer.

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1957 WINTER TEST PROGRAM

Committee on Winter Driving Hazards

Test Objectives

The 13th winter test program was conducted by the Committee on Winter Driving Hazards on Pine Lake near Clintonville, Wis., January 21-29, 1957. The objectives of the test program were to obtain data on traction, braking and cornering on ice and snow which could be used to compare the performance of the 7.50-14 tire and the 6.70-15 tire in both highway and mud-snow types. Tests were also conducted on effects on different weight distribution, change in tire pressure and reinforced tire chains.

Acknowledgments

Support for the activities of the Committee on Winter Driving Hazards comes from many organizations and individuals. Indeed, test programs of the size and scope conducted by the committee would not be possible without the active and unselfish cooperation of the automobile industry and others concerned with traffic management responsibilities.

Vehicles, equipment, personnel and other assistance for the 1957 tests were furnished by the following cooperating organizations:

Automobile Manufacturers Association
Clintonville (Wisconsin) Association of Commerce
National Association of Chain Manufacturers
Portland Cement Association
Armour & Company
Bendix Products Div. Bendix Aviation
Blackhawk Manufacturing Company
Chrysler Corporation
Dana Corporation
Firestone Tire and Rubber Company
Four Wheel Drive Auto Company
Gates Rubber Company
Goodyear Tire & Rubber Company
General Motors Proving Grounds
B. F. Goodrich Company
Highway Trailer Company
U. S. Rubber Company
Warner Electric Brake & Clutch Company
Hardware Mutuals Insurance Company
Safe Winter Driving League
University of Wisconsin
Wisconsin Highway Department
City of Clintonville, Wisconsin
U. S. Bureau of Public Roads

Definition of Terms (Used in this report)

1. Braking Distance—The distance traveled between the point of first retardation by the brakes and the point at which the vehicle comes to rest.
2. Static Traction—The drawbar force developed by a stationary vehicle just prior to wheel spin as power is gradually applied. (This was obtained by process described later in this article.)
3. Spinning Traction—The drawbar force developed at 2.5 m.p.h. vehicle speed with rear tires revolving at 7.5 m.p.h.
4. Cornering Ability—The speed at which the test vehicle could negotiate the test circle without lateral breakaway of the rear wheels.

Findings and Conclusions

Overall Performance—14″ Tire vs 15″ Tire

1. The 14″ tire generally stopped in slightly shorter distances and developed slightly greater static and spinning traction than the 15″ tire while there was no significant difference in the cornering ability of the 7.50-14 and the 6.70-15 tire.

Traction—Ice

2. In the spinning traction tests on glare ice, the 14 inch highway type tires developed 17 per cent more traction than the 15 inch highway type but the 15 inch mud-snow type developed 7 per cent more than the 14 inch mud-snow type. In static traction tests on glare ice there was practically no difference between the two tire sizes for the highway types, however, the 14 inch mud-snow type developed 5 per cent more traction than the 15 inch mud-snow type.
3. In the spinning traction tests on glare ice, mud-snow type tires developed 57 per cent more traction than highway type tires. Reinforced tire chains under these same conditions developed 800 per cent more traction than highway type tires.
4. In the static traction tests on glare ice, there was no significant difference between the highway and mud-

snow tire. Reinforced tire chains under these same conditions developed 150 per cent more pull compared to highway type tires.

Traction—Snow

5. In the spinning traction tests on loosely packed snow, the 14 inch highway type tires developed 14 per cent more traction than the 15 inch highway type and the 14 inch mud-snow type developed 15 per cent more traction than the 15 inch mud-snow type. In static traction tests on loosely packed snow the 15 inch highway type tire developed 5 per cent more traction than the 14 inch highway type but the 14 inch mud-snow type developed 8 per cent more traction than the 15 inch mud-snow type.
6. In the spinning traction tests on loosely packed snow, mud-snow type tires developed 160 per cent more traction than highway type tires. Reinforced tire chains under these same conditions developed 500 per cent more traction than highway type tires.
7. In the static traction tests on loosely packed snow, there was an advantage of 7 per cent for mud-snow tires over highway tires. Under the same conditions, reinforced tire chains developed 90 per cent more traction than highway type tires.

Braking—Ice

8. Braking distance using 14 inch highway type tires on glare ice and adjusted to a temperature of 20 degrees averaged 181 feet while braking distance under the same conditions for 15 inch highway type tires averaged 194 feet. The 14 inch mud-snow type tires averaged 166 feet and the 15 inch mud-snow type tires averaged 171 feet at 20 degrees. Braking distance using reinforced tire chains on glare ice was 83 feet.
9. Tires of the mud-snow type reduced braking distances on glare ice an average of 10 per cent compared to highway type tires. Reinforced tire chains on highway type tires reduced braking distances an average of 56 per cent.

Braking—Snow

10. Braking distance on loosely packed snow using 14 inch highway type tires averaged 55 feet and 57 feet for the 15 inch highway type. The 14 inch mud-snow type braking distance averaged 49 feet and the 15 inch mud-snow type averaged 48 feet. Braking distance using reinforced tire chains on loosely packed snow was 39 feet.
11. Tires of the mud-snow type showed reduced braking distances on both loosely packed and undisturbed snow of 13 per cent compared to highway type tires. Reinforced tire chains under these same conditions on highway type tires reduced braking distances 31 per cent.

Cornering—Ice

12. There was no apparent difference in the cornering ability of the 14 inch and 15 inch tires.
13. The cornering ability of the mud-snow type tires averaged 5 per cent greater than that of the highway type.

Weight Distribution

14. When weight on the rear wheels was increased from 38 per cent to 60 per cent of the total vehicular weight, braking distances decreased 13 per cent and spinning traction was increased 153 per cent.
15. When weight on the rear wheels was increased from 42 per cent to 53 per cent of the total vehicular weight, the cornering ability was increased 12 per cent.

Tire Pressure Variation

16. Varying tire pressures from those recommended by the tire manufacturers had an insignificant effect on braking distance, traction and cornering ability.

Test Equipment and Location

Vehicles—Three 1957 V-8 four-door sedans equipped with automatic transmissions were used in running the tests. One car was assigned to each of the three types of tests. The car used in the braking tests was equipped with power brakes. The one used in the traction tests was equipped with a locking differential. The third car was used on the cornering tests and except for the automatic transmission had no special equipment.

Each of the three vehicles was operated by the same test driver throughout the test program. Specifications on vehicle weight for various load conditions are given in Table III.

Tires—Three major tire and rubber companies supplied complete tire sets of the following types and sizes:

Highway type—6.70-15 and 7.50-14
Mud-Snow type—6.70-15 and 7.50-14

Tires were of 100-level (original equipment) quality and the tread design was similar for the 14 and 15-inch tires furnished by each company. In all cases tread design and material were considered standard.

Test tires were delivered to the test site mounted on wheels which permitted both tire sizes to be used on the test vehicles interchangeably.

Instrumentation — Instruments specifically designed to meet the requirements of the various test procedures were furnished by several organizations participating in the test program.

Instrument Calibration—Speed, distance and force measuring instruments were checked before and after the test programs to insure reliability of test data.

Traction tests required measurements of pulling ability of the test vehicle. To obtain these measurements a dynamometer truck was employed. The dynamometer truck was equipped with a sensitive speedometer and a strain gage drawbar for measuring the force produced by the test vehicle in the tow cable between the truck and test vehicle. The traction test vehicle was also equipped with a speedometer designed especially for accurate speed readings.

Braking tests required measurements of braking distance and accurate speed indications. For this purpose a fifth wheel odometer was attached to the vehicle.

Cornering tests required accurate measurements of vehicle speed.

Ambient air temperatures were continuously recorded by means of a recording thermometer. Ice surface temperature readings were obtained from thermometers placed directly on the ice.

Test Location and Site Preparation—During the past 10 years, seven previous test programs have been conducted in the Clintonville, Wis., area. For tests which require glare ice surfaces, Pine Lake is quite suitable. It is a relatively shallow lake with ice conditions that are predictable to a high degree. In addition, Clintonville offers suitable accommodations and shop facilities required for a test program such as described in this report.

Preparation of the test site began approximately eight weeks prior to test operations. Early in December, 1956, the test site was laid out on six-inch thick ice and the removal of snow was effected as necessary until the test operation. Extremely cold weather prior to the test program had caused the ice to increase in thickness to 24 inches. Several days before test operations were scheduled to start, the ice surface was shaved with a road maintainer and broomed with a power rotary broom so as to present a uniform surface. The weather just before test operations consisted of a two-day thawing period followed by an extremely sharp sub-zero freeze. This condition contributed greatly to the ice smoothness and presented a fairly consistent sheet of glare ice. During the test period, ice treatment consisted of snow removal by a light snow plow and practically continuous power brooming.

A loosely packed snow test site was prepared by operating vehicles over a marked trail laid out on the snow covered lake ice. Braking and traction tests conducted on this loosely packed snow did not penetrate to glare ice and therefore this snow condition was considered fairly realistic.

The test area included:

Straightaway—1000 x 100 ft. glare ice strip
Circular track—glare ice track 50 ft. wide with a 400 ft. inside diameter
Service area—150 ft. x 150 ft.
Loosely packed snow trail—approximately ¼ mile long and on top of lake ice
Undisturbed snow—approximately ½ mile long on top of lake ice.

Test Descriptions

Braking Tests—All braking distance tests were made from a speed of 20 miles per hour with locked wheels. In making each test, the driver would attain a speed slightly in excess of 20 m.p.h., remove his foot from the accelerator, and at exactly 20 m.p.h., apply the brakes and actuate the distance measuring device.

Traction Tests—Two types of traction tests were made:

(1) Spinning traction tests consisted of recording drawbar pull when the test vehicle's rear wheels were revolving at an indicated 7.5 m.p.h. with the car being restrained by the dynamometer truck which was traveling 2.5 m.p.h.

(2) Static traction tests consisted of observing measurements of peak drawbar pull with test vehicle stationary and power gradually applied until wheel spin occurred. Testing was accomplished in the following manner: Immediately after spinning traction tests are completed, the towing dynamometer truck brings the test car to a halt by applying its own brakes. The driver of the test car then gradually depresses the accelerator until wheel slippage occurs, the observer simultaneously observes peak drawbar pull. The throttle of the test car is then closed sufficiently to prevent continued wheel spinning and the towing dynamometer brakes are released. The two vehicles then move forward sufficiently to allow the wheels of the test car to be in contact with another portion of road (ice or snow) surface. This procedure is repeated several times until reasonably stabilized readings are obtained.

Traction tests were made in both directions on the ice to cancel wind and ice surface effect.

In both cases, traction force was measured in pounds of drawbar pull exerted in a tow cable connecting the test vehicle to a restraining vehicle (dynamometer truck).

Cornering Tests—Starting at a low speed, the test driver slowly increased speed on a 400-foot diameter course. Cornering ability was measured by determining the speed at which the rear wheels started to drift laterally on this circular ice test course. Test tires were used on the rear wheels only.

Weight Distribution Tests—Braking, traction and cornering tests were conducted on highway and snow tires and with reinforced tire chains with various loading conditions introduced by means of lead ballast placed in various predetermined locations on the test vehicle, as follows:

1. Immediately behind radiator grill.
2. Immediately behind front seat, on floor.
3. Rear of trunk.

Twelve 50-pound bags of lead shot were used as ballast.

Tire Pressure Tests—Braking, traction and cornering tests were conducted on 14 inch and 15 inch highway tires with various tire pressures. Test pressures were varied from 10 to 40 pounds per square inch.

DECKED OUT IN ARCTIC-TYPE clothes, scientific skidders were testing tires here at Pine Lake.

Control Tires—Control tires provided a means of measuring the affect of test operation variables such as air and ice temperature, surface polishing due to procedures and amount of ice or snow particles present. To provide a base for comparison of different tires, each test group (braking, traction and cornering) made test runs using control tires for the first and last runs and between each two test series during the test period.

Data Reduction—Tire rating is used to provide a means of comparing performance. The rating of each tire was obtained by the following method:

1. Individual measurements were averaged to obtain a value for the run of ten trials.

   All conclusions, ratings and performance figures used in this report are based on average performance of similar types of tires. For instance, braking performance of the highway type 6.70-15 tire on ice is expressed as an average rating for the performance of all tires of this type and size submitted by the three participating tire companies.
2. Run averages for the control tires were plotted with the time of day as abscissa and the performance measurement (braking — feet, traction — pounds, cornering — m.p.h.) as ordinate. The points were then connected by straight lines.
3. A rating was then obtained by comparing the test tire performance to the control tire performance, which is always 100, picked from the graph for the time of the test tire run and expressing this as a ratio. Superior performance is expressed by a rating higher than 100.
4. Performance figures for each test and surface shown in Figures 1 through 6 were obtained by averaging actual performance results for all brands of a given type and size of tire during desired temperature conditions and then expanding this to include other types and sizes by using a ratio of performance ratings.

DISCUSSION

The following table gives an overall comparison of performance ratings obtained in the 1957 test program:

TABLE I

Type Test and Surface	PERFORMANCE RATINGS**				
	Highway Type		Mud-Snow		Reinforced Tire Chains on Highway Type Tires
	15"	14"	15"	14"	
*Average Deceleration**					
Glare Ice	100	107	114	117	234
Loosely Packed Snow	100	102	114	113	135
Undisturbed Snow	100	104	124	122	156
Traction					
Spinning					
Glare Ice	100	117	176	165	968
Loosely Packed Snow	100	114	258	298	623
Static					
Glare Ice	100	102	99	104	251
Loosely Packed Snow	100	95	100	108	186
Cornering	100	100	105	104	—

*Calculated from braking distance assuming constant deceleration.
**Ratings based on 100 for 15" highway type tire.

Temperature—This year's tests show that temperature is a major factor affecting tire performance and, with the new 14 inch tires, the story is no different. As temperature rises, braking distances become longer. This difference is most apparent on ice or packed snow. In other words, wet ice (32° F.) is a very hazardous road surface. For example:

NEW TIRES, stored in huge trailer trucks shown here, were tested for stopping and starting.

QUICK TIRE CHANGE. About 190 sets of tires were changed a day. Each tire took about three minutes.

Braking distances from 20 m.p.h. on glare ice varied with air temperature changes as follows:

14 inch Highway tire	*14 inch Mud-Snow tire*
2°—127 ft.	5°—117 ft.
22°—180 ft.	19°—152 ft.

Traction—Ice—Test results again point out the advantage of employing a driving technique that does not cause the wheels to spin excessively when starting and maintaining vehicle motion. Depending upon the size and type of tire tested nearly three to five times more traction was developed by the static traction test procedure (Figure 2) than by the spinning traction test procedure (Figure 1).

Results of the static traction test also reveal that starting ability, from standstill of the highway tire and mud-snow tire, are practically equal up to the point of wheel slippage.

However, with wheels slipping, the spinning traction tests revealed that mud-snow tires developed an average of 57 per cent more traction than highway tires.

We should not lose sight of the fact that excessive wheel spin develops heat and therefore, reduces traction. (It is strongly recommended that future spinning traction tests be developed that will permit measurement of a slowly revolving wheel at point of incipient wheel spin.)

Reinforced tire chains showed an improvement of 870 per cent over the highway type tires on the spinning traction tests and an improvement of 150 per cent over the highway tire on the static traction tests. (For 6.70-15 tires)

Figure 1. Spinning Traction Ability—Glare Ice

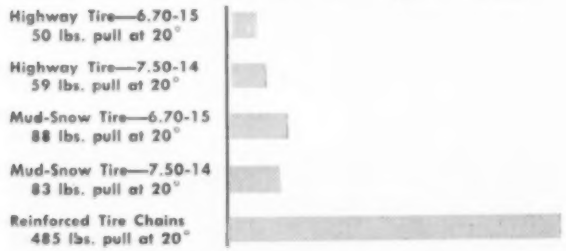
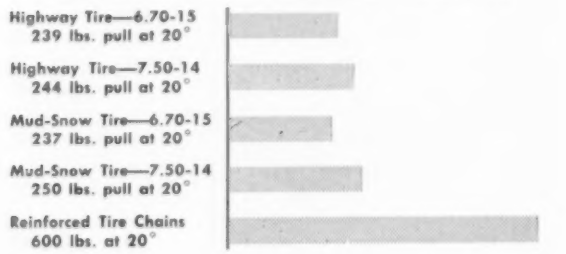


Figure 2. Static Traction Ability—Glare Ice



Traction—Loosely Packed Snow

The general pattern of results is the same as on ice when testing under snow conditions. However, the superiority of mud-snow tires over the highway tire on snow is indicated by the spinning traction test—160 per cent more traction is developed. The static traction tests showed a gain of 7 per cent for the mud-snow tires over the highway tires.

Reinforced tire chains showed an improvement of 520 per cent over the highway tire on the dynamic traction tests and a gain of 86 per cent over the highway tire on the static traction tests. (For 6.70-15 tires)

Figure 3. Spinning Traction Ability—Loosely Packed Snow

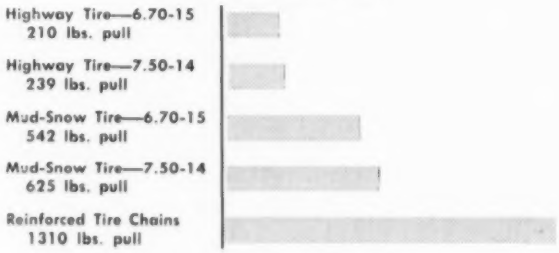
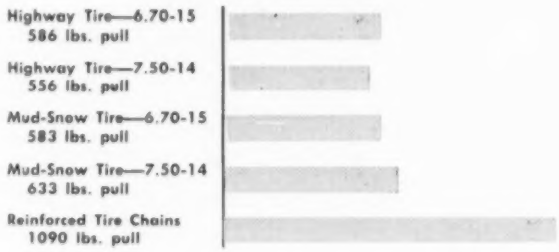


Figure 4. Static Traction Ability—Loosely Packed Snow

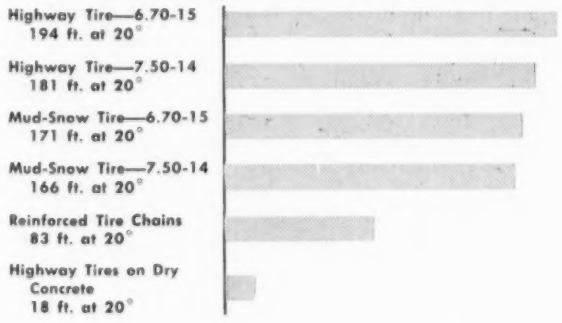


Braking—Glare Ice

The mud-snow tires showed a gain over the highway tires, comparing both 14 inch and 15 inch. This improvement amounted to 10 per cent.

Reinforced tire chains reduced braking distances 56 per cent over the highway tire.

Figure 5. Braking Distance from 20 mph—Glare Ice

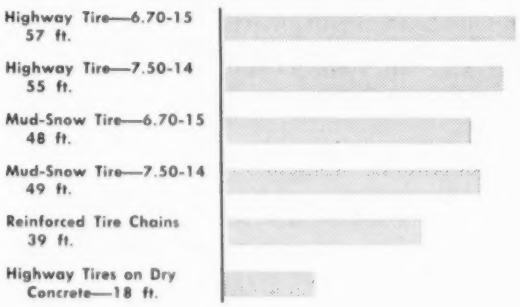


Braking—Loosely Packed Snow

Again the pattern of the mud-snow tire is similar to that found when braking on glare ice. On these tests an improvement of 13 per cent was gained by this type tire over the highway tire.

Reinforced tire chains when compared with highway tires showed a gain of 43 per cent.

Figure 6. Braking Distance from 20 mph—Loosely Packed Snow



Weight Distribution

For the past few years there has been a gradual increase of vehicle weight carried on the front wheels. For example a 1950 model car had a 50-50 per cent curb weight distribution. The same model car in 1957 has a 4 per cent increase on front wheel weight or 54-46 per cent (front and rear) curb weight.

In order that the committee might explore this problem it was decided to use a sufficient amount of ballast to obtain a considerable change in percentage of vehicular weight carried by either axle. This was accomplished by use of twelve 50 lb. (600 lbs.) bags of shot. They were located as follows:

1. Immediately behind the radiator grill. *63 per cent* on front axle.
2. Immediately behind the front seat, on the rear floor. *51 per cent* on front axle.
3. Ballast placed in extreme rear of truck. *41 per cent* on front axle.

Tire Pressure Variation—It is a common misconception that lowering tire pressure is one way to improve tire performance on ice and snow. The committee has conducted tests on this subject several times in the past, and again test results indicate that tire pressures should not be changed from those recommended by the tire manufacturer. Some very slight increase might be expected in static traction with tires slightly deflated, but operating characteristics suffer badly in other categories. (See Table IV.) For this reason, tire pressures other than recommended by the tire manufacturers, are not advised.

TABLE II
EFFECT OF WEIGHT DISTRIBUTION

TYPE OF TEST (1)	WEIGHT						
		Per Cent on Front Wheels					
	Total*	62.7	58.0	50.3	51.6	47.0	40.5
		Performance Ratings					
Traction—Static	4515	104		152			264
Braking—							
Tire Average	4526	90		99			102
Tire Chains	4526	139		147			158
Cornering (300# ballast)	4193		96		98	107	

(1) All Tests on glare ice
*Includes Vehicle with Ballast and Two Passengers

TABLE III
TEST VEHICLE WEIGHT
V-8 FOR FOUR DOOR SEDAN

LOAD CONDITION	WHEEL WEIGHTS					%
	FRONT		REAR			On
	Left	Right	Left	Right	Total	Front
Empty Vehicle #41	983	963	812	818	3576	54.4
Empty Vehicle #42	951	958	840	816	3565	53.5
Empty Vehicle #43 (1)	965	940	813	825	3543	53.8
Empty #42 600# in front	1300	1333	775	756	4164	63.2
plus 600# in center	1051	1065	1049	1000	4165	50.8
600# in rear	883	830	1261	1191	4165	41.1
#42 with 2 -plus 300# passengers in front	1228	1227	895	880	4230	58.0
front seat center	1100	1084	1030	1017	4231	51.6
rear	1034	955	1155	1086	4230	47.0

TABLE IV
TIRE PRESSURE VARIATION PERFORMANCE RATINGS

TYPE OF TEST[2]	Tire Pressure—Pounds Per Square Inch					
	10#	15#	22#[3]	24#[4]	30#	40#
Spinning Traction—						
Highway—15"	NR[5]	51		100	119	90
Highway—14"	NR	75	100		119	151
Static Traction—						
Highway—15"	69	130		100	97	106
Highway—14"	103	112	100		95	94
Braking—						
Highway—15"	84	95		100	101	103
Highway—14"	85	94	100		98	98
Cornering—						98
Highway—15"	91	96		100	97	109
Highway—14"	92	93	100		104	

(1) Two passengers in front seat decreases per cent of weight on front wheels approximately one half of one per cent.
[2]All Tests Made on Glare Ice
[3]Manufacturers Recommended Tire Pressure—7.50-14"
[4]Manufacturers Recommended Tire Pressure—6.70-15"
[5]NR—Test Results Not Recorded

Listing of

RESEARCH PROJECTS

BELOW is a list of research projects of which the National Safety Council has knowledge. Some of these projects are still in the process of completion, some have been already completed, and some have been recently published.

Each project has been classified by a library classification number, used by the Bureau of Highway Traffic at the Yale University. Each member is a subdivision of a principal heading. The headings are as follows:

000 General
100 Road Users
200 Vehicles
300 Fixed Facilities
400 Traffic Characteristics and Controls
500 Law
600 Education
700 Edministration
800 Economic and Sociological Aspects
900 Planning

The title is in quotes, and the name and address of the institution where the research is being done follows, with the name of the principal investigator. Short summaries are available on what the investigators are trying to do, but anyone wanting more than a summary of 100 or 200 words will have to correspond directly with the institute or individual doing the research.

All of this material will be abstracted and presented in the future in more detail than the list below provides. These abstracts will be published in subsequent editions of the RESEARCH REVIEW in the space now used for this listing. Any new reports of research will be immediately abstracted and presented in this journal in the earliest possible edition. In the March edition of each year a revised listing similar to the one below will be printed and will contain all additional research titles, etc., that have been received during the past year.

#010—"Dictionary of Highway Traffic"—The Traffic Institute, Northwestern University, 1804 Hinman Ave., Evanston, Ill., W. R. Stebbins, Jr., Project Mgr.; J. Stannard Baker, Director. Jan.58.

#101—"Visual Screening of Applicants for Illinois Driver's Licenses"—*Psychological Abstracts,* Vol. 31, No. 2, Apr.57, Sec. Carpentier's Office, State of Illinois.

#101—"An Analysis of One-Car Accidents"—Engineering Experiment Station, Ohio State University, Columbus, Ohio—Richard W. Bletzacker and Thomas G. Brittenham, Research Associates, Thesis. No publication. Jan.58.

#101—"Development of a Criterion for Driving Performance"—Driving Research Laboratory, Iowa State College, Ames, Iowa, Dr. A. R. Lauer, Director; Dr. Virtus W. Suhr, Research Assistant.

#101—"Effect of Rest Pauses and Refreshment on Driving Efficiency"—Driving Research Laboratory, Iowa State College, Ames, Iowa, Dr. A. R. Lauer, Director; Dr. Virtus W. Suhr, Research Assistant.

#101—"The Application of Statistical Control Methods for the Reduction and Control of Industrial Accidents" (Vol. II)—Dunlap and Associates, Inc., 429 Atlantic St., Stamford, Conn., Sebastian B. Littauer and Thomas S. Irby, Research Staff. 1955.

#101—"An Outline for a New Approach to the Problem of Highway Accidents"—U. S. Naval Hospital, Philadelphia, Pa., Frederick L. McGuire. Apr.57.

#101—"Psychological Comparison of Automobile Drivers: Accident- and Violation-free vs. Accident-Violation-Incurring Drivers"—U. S. Naval Hospital, Philadelphia, Pa., Frederick L. McGuire. Apr.57.

#101—"The Safe-Driver Inventory"—U. S. Naval Hospital, Philadelphia, Pa., Frederick L. McGuire. Apr.57.

#101—"Accidents and the Human Factor"—Cornell University, Ithaca, New York, Alan McLean. Apr.57.

#101—"The Iowa State College Driver Reaction Inventory"—Driving Research Laboratory, Iowa State College, Ames, Iowa, Dr. A. R. Lauer, Director; Dr. Rogers.

#101—"Driving Experience and Opinion Survey' Institute of Transportation and Traffic Safety, Univ. of California, Los Angeles, Roger G. Stewart and Harry W. Case.

#101—"Car-Driving Consistency and Measures of Personality"—*Psychological Abstracts,* Vol. 31, No. 2, Apr.57, Peter Venables.

#101—"Traffic Safety Communications and Drivers' Motivations"—Opinion Research Corp., Princeton, N. J.; Henry W. Wolpert, Survey Director, ATA Foundation, Inc., Washington, D. C.; Henry Liebschutz, Asst. to the Chairman.

#130—"Some Personal and Social Attitudes of Habitual Traffic Violators"—Institute of Transportation & Traffic Safety, U. of California, Los Angeles 24, Harry W. Case and Roger G. Stewart. 57.

#130—"Biomechanics in Crash Mortality"—Dept. of Orthopedic Surgery, New York U., 115 E. 61 St., New York, N. Y., Dr. Chas. Murray Gratz.

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SEPTEMBER, 1958

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41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

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81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

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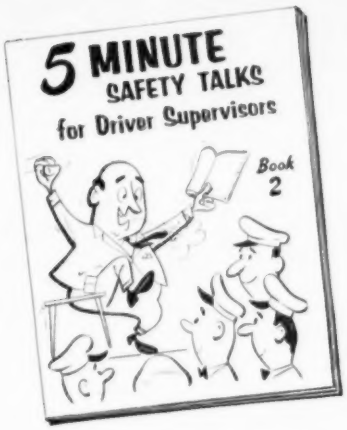

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ABOUT THE AUTHOR:

These talks were prepared by Russell FitzPatrick, one of today's most colorful, original, and authoritative writers on the subject of driver selection, training and supervision, and the problems of motor fleet management. Now an independent consultant on fleet operations, FitzPatrick was on the faculty of Texas A. and M. College where he taught courses in fleet operation. He has appeared as an instructor on many fleet supervisor training courses throughout the country and has had wide practical experience in the field of fleet safety supervision.

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